

**FIREFLY SPECIES FACT SHEET:**  
**Pointy-lobed firefly (*Photinus acuminatus*)**



*An adult male pointy-lobed firefly. (Richard Joyce/Xerces Society).*

**March 2024**

**Richard Joyce**  
**Xerces Society for Invertebrate Conservation**



**Scientific Name:**

*Photinus acuminatus* Green, 1956

Phylum: Arthropoda

Class: Insecta

Order: Coleoptera

Family: Lampyridae

Subfamily: Lampyrinae

Tribe: Lucidotini

(ITIS - Report: *Photinus acuminatus*, 2023)

Synonyms: None

**Common Name:**

Pointy-lobed firefly

**Taxonomic Note:**

The initial description of *Photinus acuminatus* by Green in 1956 was based on just two specimens (one male and one female), so very little intraspecific variation is reflected in this description.

*Photinus acuminatus* belongs to Green's Division I of North American *Photinus*, which lack ventro-basal processes on the median lobe of the aedeagus. Other members of this group include *Photinus texanus*, *P. immaculatus*, *P. cookii*, *P. marginellus*, *P. curtatus*, *P. floridanus*, and *P. sabulosus* (Green, 1956).

**Conservation Status:**

Global Status: G1 – Critically Imperiled (last reviewed 21 December 2021)

National Status (United States): NNR – National conservation status not yet assessed

State Status: SNR – S (FL, GA, MS, NC, SC, OH)

(L. Faust & Walker, 2021)

Species of Greatest Conservation Need: South Carolina (2015)

**Technical Description:**

Adult: *Photinus acuminatus* has a somewhat non-descript appearance and looks superficially similar to *Photinus consanguineus* complex species in its coloration and markings (Green, 1956). The body length can range from 7.5 mm to 9 mm. The size range overlaps with that of *Photinus marginellus*, but the body shape is wider (Green, 1956). The elytra are dark brown with a yellow suture and a wide pale-yellow lateral border (Figures 1, 2, 3, and 4).

Green describes the pronotum as having a wide dark median marking (vitta) that reaches the base and expands apically but diffuses before reaching the apex (Green, 1956). However, the central pronotal marking on an adult male specimen collected in Ohio in 2017 narrowed to a point at the base (Faust et al. 2019, see Figure 3). The scutellum is a shiny dark blackish brown (piceous). The ventral segment anterior to the light organs is pale-colored. Figures 5 and 6 provide ventral views of specimens.

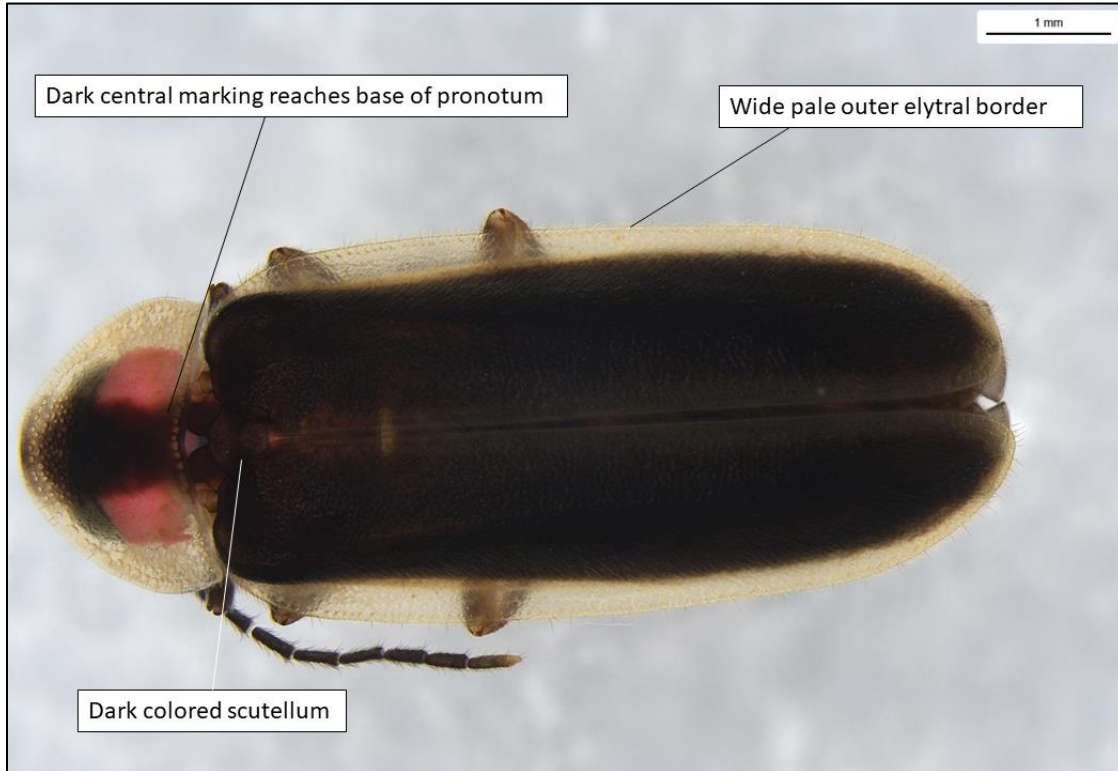


Figure 1. Dorsal view of a male *Photinus acuminatus* that had been preserved in ethanol in Greenville County, SC, with field marks noted. (Luiz Felipe da Lima Silveira, with annotations by Richard Joyce/Xerces Society).



Figure 2. (a) Dorsal view of the holotype specimen of *Photinus acuminatus*. (b) Dorsal view of the holotype specimen of *Photinus acuminatus* from North Carolina. Note the dark color of the scutellum and mesonotal plates, the broad yellow lateral margins on the elytra, and the dark central pronotal marking, which touches the bases of the pronotum but not the apex. (Images courtesy of the California Academy of Science.)



Figure 3. Dorsal view of *Photinus acuminatus* collected in southern Ohio. Note the wide pale elytral margins and the pronotal marking that narrows at the base, atypical compared to other specimens. (Laura Hughes).



Figure 4. Dorsal view of a live adult male pointy-lobed firefly. (James E. Lloyd).



Figure 5. Ventral view of the holotype specimen of *P. acuminatus*. (California Academy of Science).

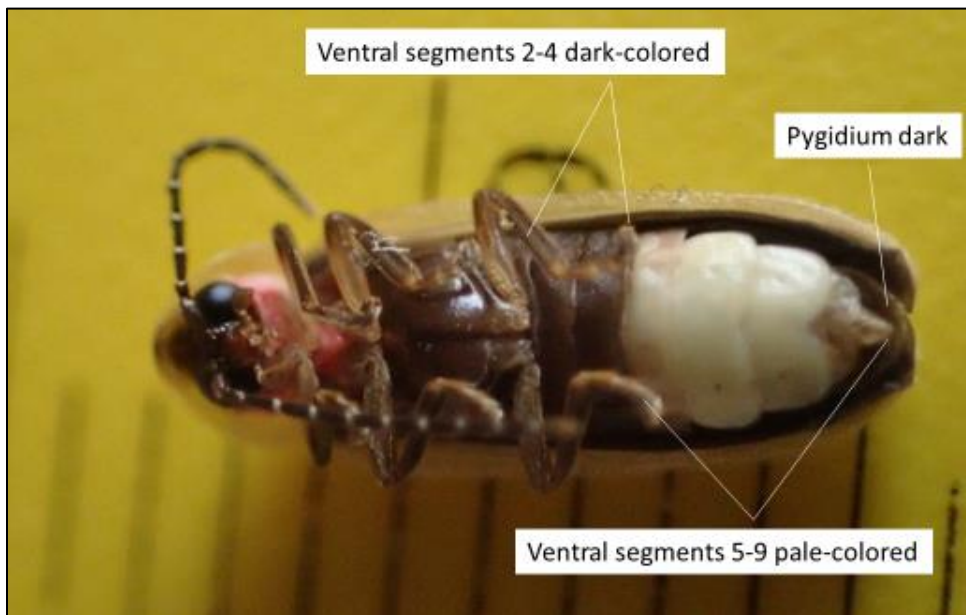


Figure 6. Ventral view of a male pointy-lobed firefly from South Carolina that had been collected and frozen. Total length is about 8.5 millimeters and the segment anterior to the lanterns is pale-colored. (Richard Joyce/Xerces Society).

Examination of the aedeagus (male genitalia) is critical for identifying *Photinus acuminatus* specimens. In *Photinus acuminatus*, the lateral lobes are weakly sclerotized, and acuminate (forming a slender point) at the tip (Figure 7). Like in other members of Green's Division I, the aedeagus (male genitalia) of *Photinus acuminatus* lacks ventro-basal processes on the median lobe of the aedeagus. However, other Division I species that could be confused based on flash pattern and general appearance, such as the *Photinus marginellus/curtatus* complex have blunt, rounded tips on the lateral lobes (Figure 8). Superficially similar, single-flashing *Photinus* in Green's Division II that could be confused with *Photinus acuminatus*, such as the *Photinus consanguineus* complex and *Photinus scintillans*, have ventro-basal processes on their aedeagi (Figures 9 and 10).

Other distinguishing aedeagus traits of *Photinus acuminatus* include a median lobe that does not extend beyond the lateral lobes (unlike in *Photinus floridana*) and a tawny or fulvous coloration (unlike in *Photinus sabulosus*).

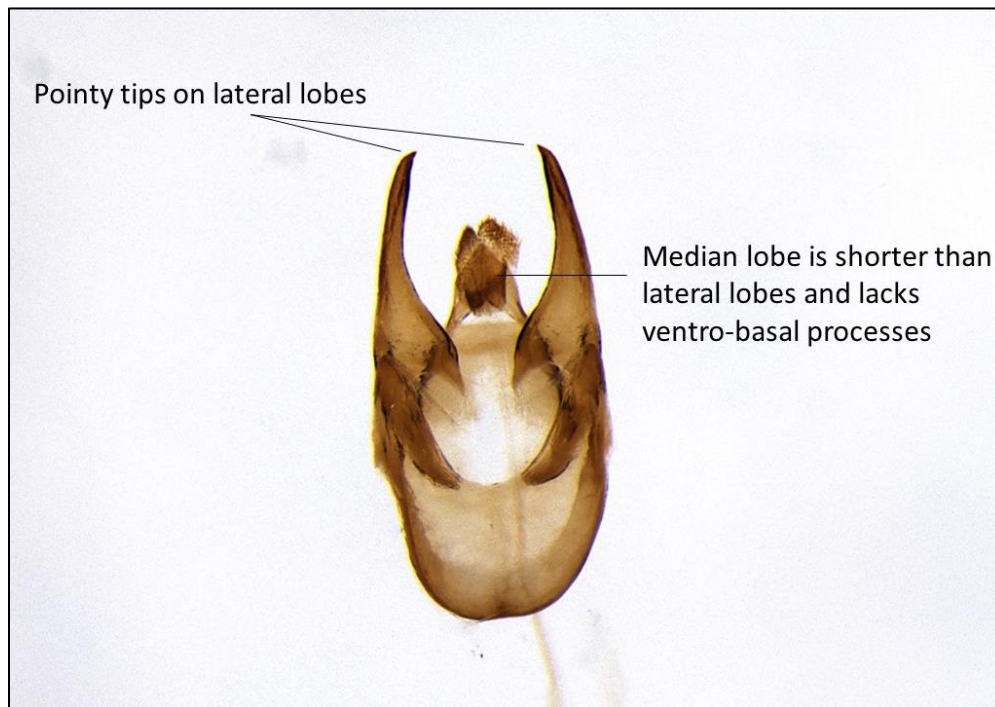


Figure 7. Ventral view of the male genitalia (aedeagus) of a pointy-lobed firefly. It has been cleaned in a potassium hydroxide solution to remove other tissues. (Luiz Felipe Lima da Silveira).

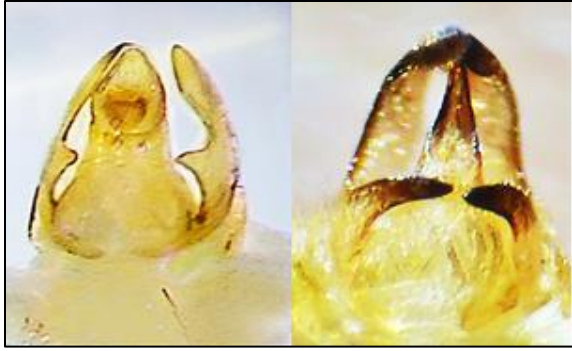


Figure 8. Photos of aedeagi of *Photinus curtatus* (left) and *Photinus marginellus* (right), members of Green's Division I *Photinus* that occur sympatrically with *Photinus acuminatus* and look superficially similar. Note the blunt tips of the lateral lobes and the dorsal branches of the lateral lobes (L. Faust et al., 2019).

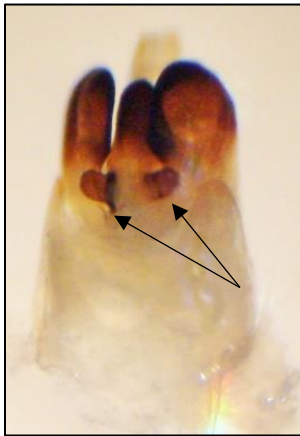


Figure 9. Photo of the aedeagus of a *Photinus* in the *consanguineus* complex (Division II). Note the stout, rounded lateral lobes and the ventrobasal processes (indicated with black arrows) on the median lobe. (Photo courtesy of Lynn F. Faust.)

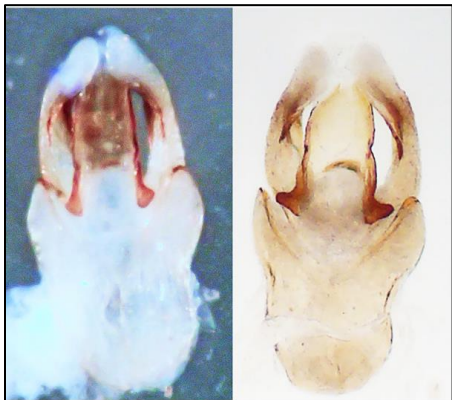


Figure 10. Photos of the aedeagus of *Photinus scintillans*, a species in Division II of *Photinus* that is sympatric in at least part of its range. Note the darker brown ventrobasal processes on the median lobe that characterize members of this division, as well as the rounded tips of the lateral lobes. (Photos courtesy of Lynn F. Faust.)

Immature: The larvae, eggs, and pupae of *Photinus acuminatus* have not been observed or described. *Photinus* larvae are generally somewhat cigar-shaped and are known to live in the soil, feeding on earthworms and other soft-bodied invertebrates (Lloyd, 2012). All known firefly larvae are bioluminescent (Lloyd, 2018), an adaptation thought to warn potential predators that they are distasteful (Lewis, 2016), and the same is likely true of pointy-lobed firefly larvae.

### **Life History:**

#### *Adult Phenology*

Because there are so few *Photinus acuminatus* records, with many localities represented by a single record, the adult phenology of the species is poorly understood. Occurrence records fall within a 59-day range between May 27<sup>th</sup> and July 25<sup>th</sup> (Figure 11).

Modified growing degree days (mGDD) are a measure of heat accumulation on a given date and over the course of the growing season, and are used to take seasonal variation into account when making phenology predictions. Using mGDD is a helpful tool for anticipating and determining the likely activity period of a firefly species during a given year (L. F. Faust & Weston, 2009). In general, mGDD values of under 1000 correspond to the spring season, while values between 1000 and 1800 are early summer and values above this are summer into early autumn (L. F. Faust, 2017). The accumulated mGDD values for *Photinus acuminatus* occurrence records (late May to late July) range from 1302 to 2750, with all but two records falling between 1500 and 2500 mGD (see Figure 12).

An adult male *P. acuminatus* captured in summer 2023 lived for 18 days in captivity, suggesting that adults live can live at least two and half weeks (L. F. Faust, unpublished data).



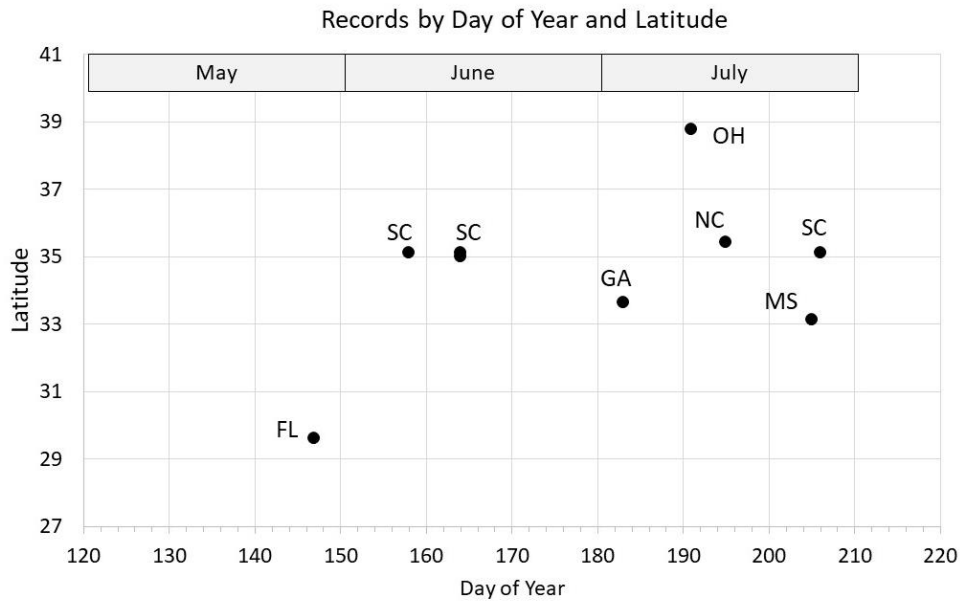


Figure 11. Observation or collection records for *Photinus acuminatus* by day of year and latitude. Records are labeled with the state of the locality. Day of year ranged from 147 (27 May) in Florida to 206 (25 July) in South Carolina.

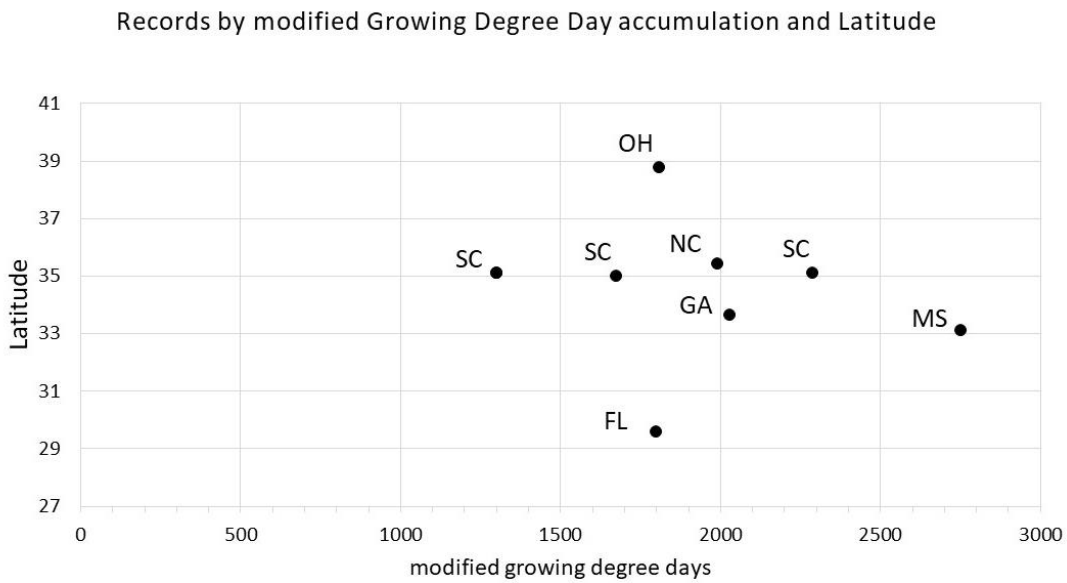


Figure 12. Observation or collection records for *Photinus acuminatus* by Latitude and accumulated modified Growing Degree Days (86/50 F, 1 March start date). Date records are labeled with the state of the site. Cumulative mGDD values of record dates) ranged from 1302 to 2750, with the minimum corresponding to 7 June 2022 in South Carolina and the maximum corresponding to 24 July 1973 in Louisville, Winston County, Mississippi.

### Co-occurring firefly species

Adult *P. acuminatus* have been known to co-occur in time and season with *Photinus macdermotti*, *Photinus marginellus*, *Photuris forresti*, and *Photuris frontalis* (Lloyd, 2018). Size, coloration, body shape, flash pattern and genitalia shape are all relevant for distinguishing these species from *Photinus acuminatus*.

### Flash Behavior

Flash behavior of male and female *Photinus acuminatus* was described by Lloyd (1969). This species displays at dusk with flashes beginning 8-17 minutes after sunset (Eargle, 2023; Joyce, 2022; Lloyd, 1969). The flash display then lasts for about 30-35 minutes. The duration of each flash or pulse is noticeably quick, estimated by Lloyd to be less than 0.1 seconds. The flash interval was reported to be two seconds at 74 degrees Fahrenheit, with occasional longer intervals when males were flying further distances (Lloyd, 1969) (Figure 13). Flash pattern interval measurements taken with voice recordings from Wattacoo Lake in Ashmore Heritage Preserve, Greenville County, South Carolina, were longer: averaging 3.2 seconds and ranging from 2.4 seconds to 4.2 seconds at 74 degrees Fahrenheit (Joyce, unpublished data). In studies of the spectral wavelength of firefly bioluminescence, *Photinus acuminatus* was found to have more red-shifted colored light than other *Photinus*, with peak wavelength of 575 nanometers (Lloyd, 2018).



Figure 13. Flash pattern diagram for *Photinus acuminatus* at 74 degrees Fahrenheit, based on observations in Florida by James E. Lloyd.

Unlike in most other North American *Photinus*, *Photinus acuminatus* begins flashing well above ground level. Lloyd described flashes as starting at heights of 2-7 meters, above and among the woody vegetation (Lloyd, 1969). Females perch on vegetation and respond to male flashes quickly with bright flashes, with a lag of about 0.3 seconds (Lloyd, 1969).

### **Range, Distribution, and Abundance:**

**Type locality:** The base of Mount Pisgah in North Carolina (Green, 1956). Because four different counties converge near Mount Pisgah (Transylvania, Haywood, Buncombe and Henderson), the county of the type locality is not known. The type locality likely falls within the boundaries of Pisgah National Forest or the Blue Ridge Parkway.

**Range:** The historic range of *Photinus acuminatus* includes Florida, Georgia, Mississippi, South Carolina, North Carolina, and Ohio (Figure 14). Its current range is unclear; in the past twenty years, the species has only been reported a site in South Carolina and a site in Ohio.

Distribution: This species has been documented from 9 sites since 1927. At least one of these, a historic site in Pickens County, South Carolina, is thought to be extirpated (Lloyd, 2012, 2018), and the status of many other historic sites throughout the range is unknown.

The level IV Ecoregions in which *Photinus acuminatus* has been documented include the Southern Hilly Gulf Coastal Plain (Mississippi), Gulf Coast Flatwoods (Florida), Southern Outer Piedmont (Georgia), Southern Crystalline Ridges and Mountains (South Carolina, North Carolina), and Knobs-Lower Scioto Dissected Plateau (Ohio). The known elevation range is from about 30 ft (10 m) in Florida to over 3,000 ft (1,000 m) at the type locality in North Carolina.

#### *Documented*

This species has been documented on multiple federal and state lands across its range. As of 2023, it has been recorded in the following public lands:

- Lower Suwanee National Wildlife Refuge, FL (US Fish and Wildlife Service)
- Ashmore Heritage Preserve, SC (South Carolina Department of Natural Resources)
- Panola Mountain State Park, GA (Georgia Department of Natural Resources)

#### *Suspected*

Given the current spread of localities, it is possible that *Photinus acuminatus* also occurs in neighboring states with similar habitats, such as Alabama, Tennessee, Kentucky, West Virginia, and Virginia.

Within states with known records, the following public lands could potentially host *P. acuminatus* populations because of their proximity to known localities:

*North Carolina:* Pisgah National Forest; Blue Ridge Parkway

*South Carolina:* Mountain Bridge Wilderness Area; Table Rock State Park

*Mississippi:* Tombigbee National Forest, Noxubee National Wildlife Refuge

*Georgia:* Davidson-Arabia Mountain Nature Preserve

*Ohio:* Wayne National Forest; Tranquility Wilderness Area, Shawnee State Park

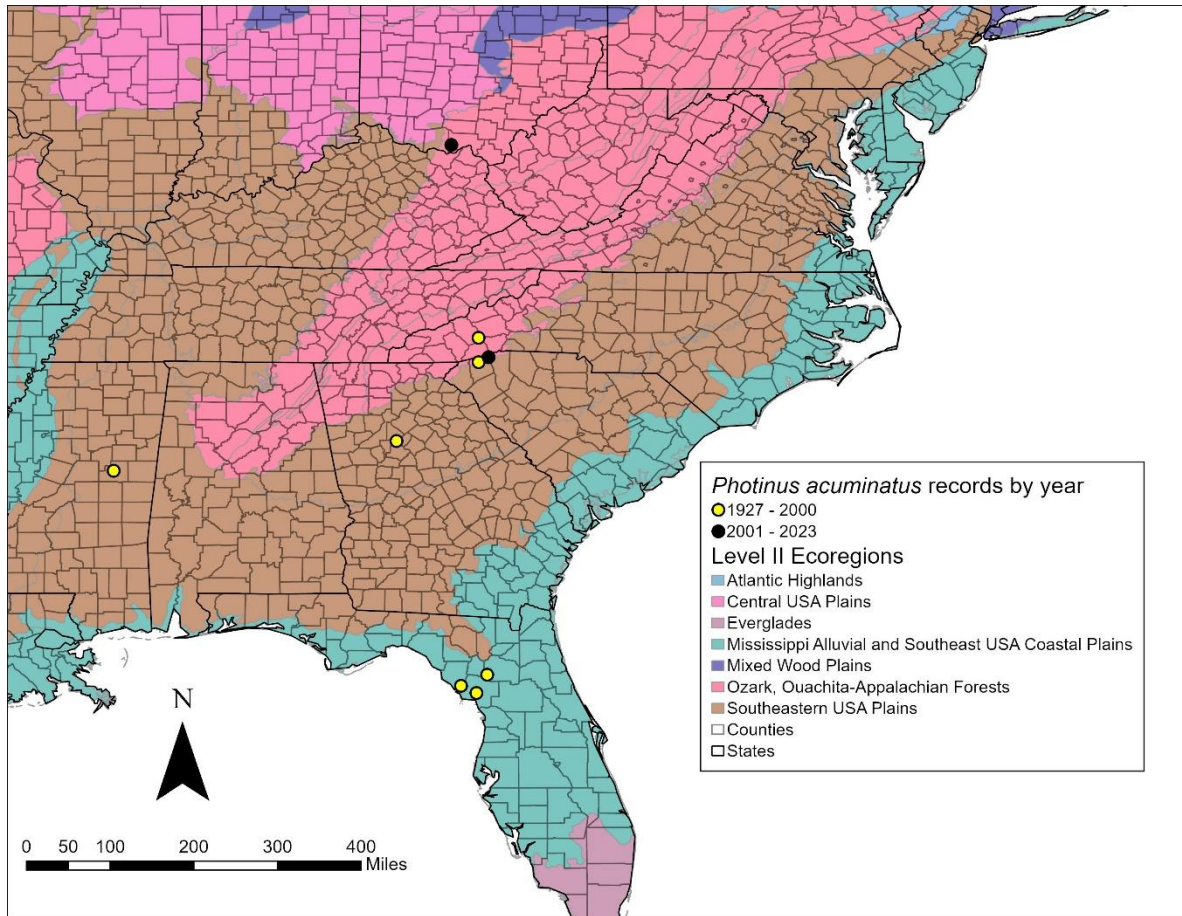


Figure 14. Map of known locality records for the pointy-lobed firefly (*Photinus acuminatus*) as of 2023. Localities are spread across three different Level II ecoregions. Records from 2000 or earlier are shown with yellow dots; more recent records are shown with black dots. Only two records are within the past twenty years, and the historic locality in South Carolina is presumed to be extirpated.

**Abundance:** While detailed estimates of abundance are not available for this species, recent surveys (in the past two years) a site in South Carolina have resulted in tallies of 11-50 and 50+ displaying adult males (Eargle, 2023; Joyce, 2022).

**Habitat Associations:**

The pointy-lobed firefly has been found in a diversity of shrubby wetland habitats, often at edges of waterways, and appears to be a habitat generalist. The records from the base of Mt. Pisgah in North Carolina; Panola Mountain in Georgia; Winston County in Mississippi; and southern Ohio lack specific habitat details. The site in Pickens County, South Carolina, was described generically as “shrubs and herbs” under a large deciduous tree (Lloyd, 2018) and the collector of the Louisville, Mississippi specimen did not recall the exact locality but speculated that it might have been an old growth short-leaf pine site (Charles Bryson, pers. comm. 2023).

Below are more in-depth descriptions for the sites with habitat information.

A **Dome Swamp Natural Community** (referred to as a “cypress-head” by J. E. Lloyd) in Dixie County, Florida, had willow (*Salix* sp.), buttonbush (*Cephalanthus occidentalis*), and wax myrtle (*Morella cerifera*) (Lloyd 1969).

A **Southern and Central Appalachian Bog and Fen** in Greenville County, South Carolina, consisted of a shrubby bog at the edge of dammed stream in the Blue Ridge Mountains (Figure 15). Woody vegetation included sweet gum (*Liquidambar styraciflua*), smooth alder (*Alnus serrulata*), red maple (*Acer rubrum*), chokeberry (*Aronia arbutifolia*), and Virginia sweetspire (*Itea virginica*). The ground layer included *Sphagnum* moss, bog clubmoss (*Lycopodiella* sp.), mountain sweet pitcher plant (*Sarracenia jonesii*), rose pogonia (*Pogonia ophioglossoides*), and tuberous grasspink (*Calopogon tuberosus*).



Figure 15. Shrubby habitat at the inlet of Wattacoo Lake at Ashmore Heritage Preserve in Greenville County, South Carolina. (Richard Joyce/Xerces Society).

### **Threats:**

Threats to the pointy-lobed firefly include habitat loss and fragmentation, the damming and modification of waterways, exposure to pesticides, and artificial light at night.

#### *Development and habitat loss*

While several of the known localities for *Photinus acuminatus* are within public lands, one locality in South Carolina was extirpated when the riparian ecosystem was cleared and bulldozed to build a golf course (Lloyd, 2012, 2018). Golf courses are often built in the flat river bottoms of the Southeast, replacing or shrinking the riparian edge habitat used by this species. Localities in Georgia and South

Carolina both have golf courses along streams in their watersheds. Agriculture in valley bottoms may also replace or degrade these habitats.

The collector of the specimen from Louisville, Winston County, Mississippi, did not recall the exact site of collection, but noted that an old-growth shortleaf pine site in the area matching the specimen label description had been cut a few years later (pers. comm. Bryson 2023), suggesting this site may also be lost or degraded.

#### *Dams and Modification of waterways*

Dams create significant changes to riparian systems, often permanently inundating upstream habitats (Nilsson & Berggren, 2000). Unlike beaver dams (which have existed on the landscape for thousands of years), human-built dams are usually larger and permanent. Depending on topography, the damming of streams and rivers may inundate and reduce the extent of the wetland vegetation types used by *Photinus acuminatus*. A site in South Carolina is upstream from a 34-foot high, 435-foot long earthen dam and a 6-acre pond. It is not known how the damming of Wattacoo Creek affected this population, but it is possible that habitat area was reduced by the inundation the riparian zone.

#### *Pesticides*

Pesticides pose a threat to fireflies generally through lethal and sublethal effects resulting from various exposure routes: aerial spraying, contaminated soil, runoff in waterways, and consumption of contaminated prey. Pesticide uses that are of particular concern for *Photinus acuminatus* include aerial spraying of mosquito adulticides (often pyrethroids) and the use of neonicotinoids in soil for agricultural, landscaping, and silvicultural purposes. In South Carolina and North Carolina, the pointy-lobed firefly occurs in areas where hemlock wooly adelgids are infesting eastern hemlock and Carolina hemlock trees, which has prompted the use of soil drenches and soil injections of imidacloprid to prevent tree mortality. Imidacloprid from hemlock wooly adelgid treatments has been shown to migrate through the soil and into surface waters (Benton et al., 2016).

#### *Light Pollution*

Artificial light at night (ALAN, also known as light pollution) has been shown to have wide range of negative effects on insects generally (Owens et al., 2020) and fireflies specifically (Owens et al., 2022; Owens & Lewis, 2022), causing interference with courtship communication and lowering reproductive success. While the courtship communication of dusk-displaying species such as *Photinus acuminatus* may be less vulnerable to disruption by ALAN compared to truly nocturnal species (Owens & Lewis, 2022), bright illumination of artificial light in firefly habitats is a cause for concern.

## Conservation Considerations:

The pointy-lobed firefly is a very rare firefly species that has been documented from fewer than ten sites in the southeastern United States and adjacent areas. It has been extirpated from at least one site, and local populations are suspected to be small. While this species is known from a handful of protected areas, there are no specific conservation measures in place to protect the firefly across its range.

### *Research needs*

Critical information gaps must be addressed to inform conservation efforts for the pointy-lobed firefly, including:

#### *Natural history*

- Are the larvae dietary specialists or generalists? What species do they prey on?
  - Test preferences for different species of earthworms and other soft-bodied invertebrates
- What microhabitat features are important to adults? To the larvae?
  - Try to observe oviposition behavior
  - Try to observe the emergence of adults, to better understand the microhabitat of pupae
- What habitat associations and factors affect the persistence of *P. acuminatus* populations?

#### *Species range and distribution*

- What is the full extent of this species' range?
- Can we use species distribution models to better inform future survey efforts?
- Can we use occupancy modeling to determine the survey- and site-level variables that influence the detection and presence of fireflies at known sites?
- What is the dispersal capacity of this species?

#### *Population size, trends, and abundance*

- What are the global and local population sizes and trends for this species?
- What monitoring protocols and/or programs do we need to develop to answer this question?
- What is the most reliable index of abundance for this species?
- What is the geographic pattern of genetic differentiation?

#### *Threats*

- What is the relative severity of threats such as habitat loss, light pollution, and climate change to the species?

- To what extent can subterranean larvae survive flooding or streambed overflow onto otherwise stable shores that they rely on for maturation?
- Can we model the impacts of drought and other climate change impacts on their populations?

#### *Conservation impacts*

- How do different management activities impact adult firefly populations?
- How do different management activities impact immature firefly populations?
- How can we use this information to guide conservation and restoration activities?

#### *Inventory and monitoring*

In addition to addressing data gaps, continued surveys of riparian habitats, freshwater shrub wetlands, and forest edges in the eastern US are needed to determine the full extent of the pointy-lobed firefly's range. Visual surveys and collection of voucher specimens at dusk are recommended in managed areas with appropriate habitat (see Suspected Distribution and Survey Protocol sections) to gather baseline data about the presence, habitat use, baseline abundance, and site-specific activity patterns of this species. As core sites for *Photinus acuminatus* are discovered or revisited, land managers could work to establish long-term monitoring programs to better understand population size, dynamics, and trends.

#### *Management actions*

Key actions that might help this firefly include:

- establishing and maintaining natural buffers around riparian habitats to maintain hydrology, protect groundwater, and reduce stormwater, pollution, and nutrient run-off
- rerouting roads and trails around sensitive habitat areas
- removing or modifying artificial light sources that may be negatively impacting populations (e.g., using motion sensors on existing lights, or replacing bright LEDs with dim red bulbs that don't interfere with firefly flash communication)
- protecting occupied sites from excessive or unnecessary pesticide application
- removing invasive plants, which may alter native plant communities and make them uninhabitable for fireflies
- assessing the impacts of proposed dams and other water modifications that may negatively impact this species' habitat
- setting up long-term monitoring programs at extant sites to gather baseline population data to better understand population trends and conservation status of this species over time, as well



as insights into the impacts that various management activities have on firefly health and abundance.

### **Survey Protocol:**

#### Where:

- Shrubby wetlands and edges of wetlands and mesic forests in the eastern United States, between Florida and Ohio.

#### When:

- Early to mid-July, as well as late May through early August as resources allow.
- Surveys should begin at sunset.
- Air temperature should be at least 60° Fahrenheit (15.5° Celsius)
- Beaufort wind scale should be Force 2 or lower (0-7 mph)
- Moon phase is not critical because of the dusk display time.

#### How:

- Review survey protocols and print data sheets from the Firefly Atlas ([www.fireflyatlas.org](http://www.fireflyatlas.org))
- Secure the appropriate permits and/or site access permissions prior to conducting surveys
- Stand or walk slowly at the shrubby wetland or forest edges at dusk, watching for twinkling displays of single flashes just above the tips of the vegetation.
- Consider recording observations using a voice memo app on a cell phone or a voice recorder, using the data sheet as a guide
- Use artificial light sparingly to maintain night vision and avoid disturbing fireflies; a dim red headlamp or a flashlight wrapped in red cellophane can be used as needed to navigate the site
- If permitted, net several individuals and take high quality dorsal and ventral photos, including a scale to show the length of the firefly. Photos will contribute to validation of species identification by a Firefly Atlas administrator or relevant species expert.
- In the field, morphological characteristics to look for include a total length of 7.5-9 mm, wide pale elytral margins, and pale coloration on the ventral segment anterior to the lanterns. These traits alone do not definitively confirm *Photinus acuminatus*, but may help to rule out other *Photinus* species.
- If pointy-lobed fireflies have not yet been documented in the area, **collect a small number of voucher specimens of adult males for positive identification.**
  - Specimens can be frozen or collected into ethanol (70-95%)
  - The specimens can be dissected and the genitalia examined under a microscope
  - Local extension offices or natural history collections may be able to assist with specimen dissection.

- If this is a known site for pointy-lobed fireflies, specimens may not be necessary, but photo vouchers are highly recommended. Submit survey data and photographs to the Firefly Atlas (regardless of whether fireflies were observed).

#### **Additional Resources:**

- Conserving the Jewels of the Night: Firefly-Friendly Lighting Practices : <https://xerces.org/publications/fact-sheets/firefly-friendly-lighting>
- Conserving the Jewels of the Night: Guidelines for Protecting Fireflies in the United States and Canada: <https://xerces.org/publications/guidelines/conserving-jewels-of-night>
- State of the Fireflies of the United States and Canada: Distributions, Threats, and Conservation Recommendations: <https://xerces.org/publications/scientific-reports/state-of-fireflies-of-united-states-and-canada>

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