Species Status Assessment

Common Name: Pyralis-mimicking Firefly **Date:** 2024-10-13

Scientific Name: *Photuris pyralomima* **Updated By:** Katie Hietala-Henschell

Class: Insecta

Family: Lampyridae

Species Synopsis

(a short paragraph which describes species taxonomy, distribution, recent trends, and habitat in New York):

Photuris pyralomima is has been documented in open and shrubby fields, moist meadows, and open areas This species is member of *Photuris* versicolor group which can be extremely challenging to identify due to plasticity in flash pattern and morphology. This species is only known from Delaware and New York. Across its range, this species has been assessed as Endangered by the IUCN Red List Firefly Specialist Group and its population trend has been assessed as decreasing (Heckscher and Walker 2021). Barber (1951) described *P. pyralomima* populations as abundant near Selkirk, New York.

The populations described from the Capital Region in 1924 may be extinct. However, this species was recently found in Delaware between 2004-2007 (Heckscher 2010). While *P. pyralomima* uses open habitats the development in the region may have been one of the factors negatively impacting this species. Barber (1951) described seeing this species on July 3rd in New York. Heckscher (2010) described seeing the species throughout June. It's likely this species is typically active from late-June through July. The loss of meadow and grassland habitat within its range and the decline in quality of fields and pastures may negatively impact this species.

In 2021, the International Union for Conservation of Nature (IUCN) Red List conducted baseline conservation assessments for nearly 80% of described firefly species in the United States and Canada. The IUCN Red List found approximately 14% of fireflies are threatened with extinction and more than half of the species (53%) could not be evaluated due to lack of data (Fallon et al. 2021). Future firefly work including monitoring and protecting populations of at-risk species, preserving, and restoring habitat, and gathering data to fill critical information gaps (e.g., population trends) for potentially rare or at-risk species, like *P. pyralomima*, will help inform conservation efforts.

I. Status

a. Current legal protected Status

i. **Federal:** Not listed **Candidate:** No

ii. **New York:** Unprotected

b. Natural Heritage Program

i. **Global:** G1

ii. **New York:** SH **Tracked by NYNHP?:** No

Other Ranks:

-New York 2025 SGCN status: High Priority Species of Greatest Conservation Need
-COSEWIC: Not listed in Canada
-IUCN Red List: Endangered
-Northeast Regional SGCN: RSGCN

Status Discussion:

The IUCN Red List Firefly Specialist Group has assessed *P. pyralomima* as Endangered and having a decreasing population trend (Heckscher and Walker 2021). This species prefers open areas including fields and pastures. Based on the single historic record, this species appears to have previously occurred in east-central New York state. Currently, Delaware is the only state with a State Conservation Rank and *P. pyralomima* has been assessed as Imperiled (S2) (NatureServe 2023). This species can be locally abundant within suitable habitat; however, the loss and decline of suitable habitat may threaten populations. Fallon et al. (2021) suggests that the greatest threats to *P. pyralomima* are habitat loss and light pollution. Other factors effecting the status of the species include pollution, natural system modifications, residential and commercial development, and agriculture (RSGCN 2023).

II. Abundance and Distribution Trends

Region	Present?	Abundance	Distribution	Time Frame	Listing status or S-Rank	SGCN?
North America	Yes	Unknown	Unknown	Unknown		
Northeastern US	Yes	Unknown	Unknown	Unknown	RSGCN	Yes
New York	Yes	Unknown	Unknown	Unknown		
Connecticut	No	-	-	-		
Massachusetts	No	-	-	-		
New Jersey	No	-	-	-		
Pennsylvania	No	-	-	-		
Vermont	No	-	-	-		
Ontario	No	-	-	-		
Quebec	No	-	-	-		

Column options
Present?: Yes; No; Unknown; No data; (blank) or Choose an Item
Abundance and Distribution: Declining; Increasing; Stable; Unknown; Extirpated; N/A; (blank) or Choose an item
SGCN?: Yes; No; Unknown; (blank) or Choose an item

Monitoring in New York

(specify any monitoring activities or regular surveys that are conducted in New York):

The Dark Skies for Fireflies project (2023-2025), a partnership between New York Natural Heritage Program (NYNHP) and the Office of Parks, Recreation, and Historic Preservation (OPRHP), is an effort to survey fireflies in New York State Parks; however, there are no systematic monitoring efforts directed toward this species.

Trends Discussion

(insert map of North American/regional distribution and status):

Photuris pyralomima is appears to be endemic to the Northeast and mid-Atlantic (Terwilliger Consulting, Inc. and the Northeast Fish and Wildlife Diversity Technical Committee 2023). The conservation assessment, completed by the IUCN Red List Firefly Specialist group, lists *P. pyralomima* as Endangered because previously documented populations have been extirpated and habitat loss is evident (Heckscher and Walker 2021). This species hasn't been relocated near the type locality, despite survey efforts, and may be extirpated from New York (Lloyd 2018). Suitable open habitat types used by *P. pyralomima* include moist meadows, hayfields, and scrub-shrub vegetated fields may be threatened by climate change, invasive species, and development. Fireflies that are restricted to specialized habitats tend to be more likely to be threatened by some level of extinction and should be included as SGCN (Fallon et al. 2021).

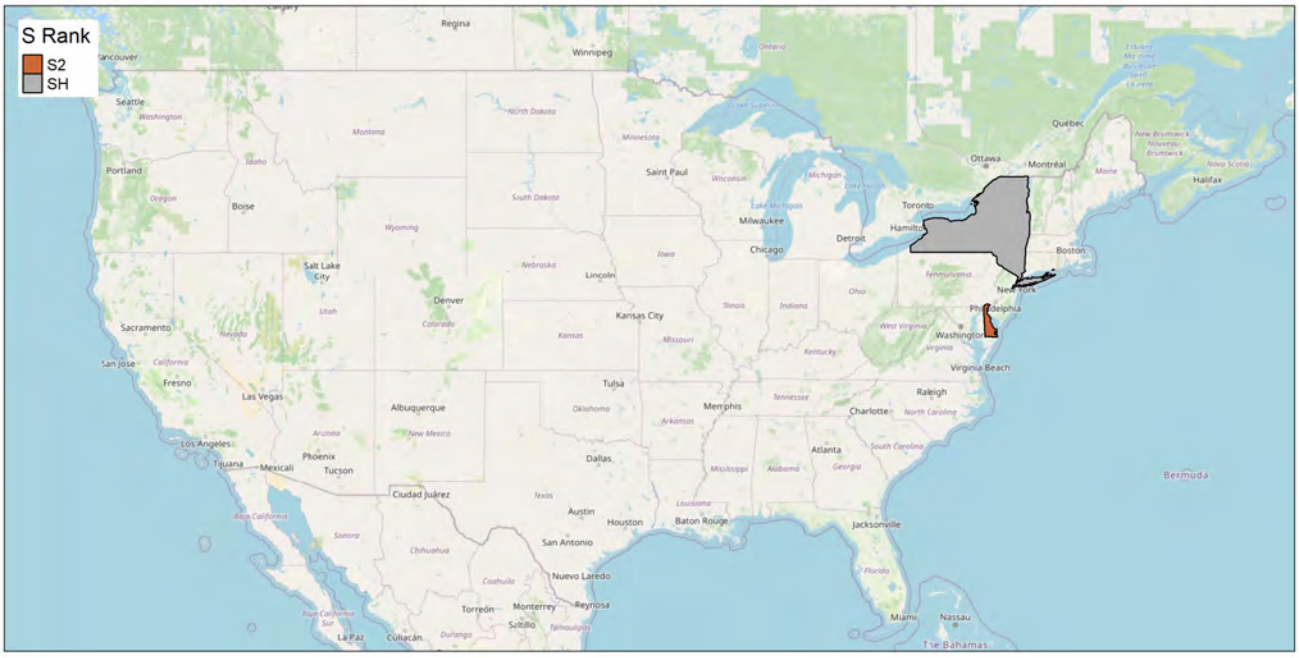

Figure 1: *Photuris pyralomima North American distribution. Points show research-grade iNaturalist observations (iNaturalist 2023, NatureServe 2023).*

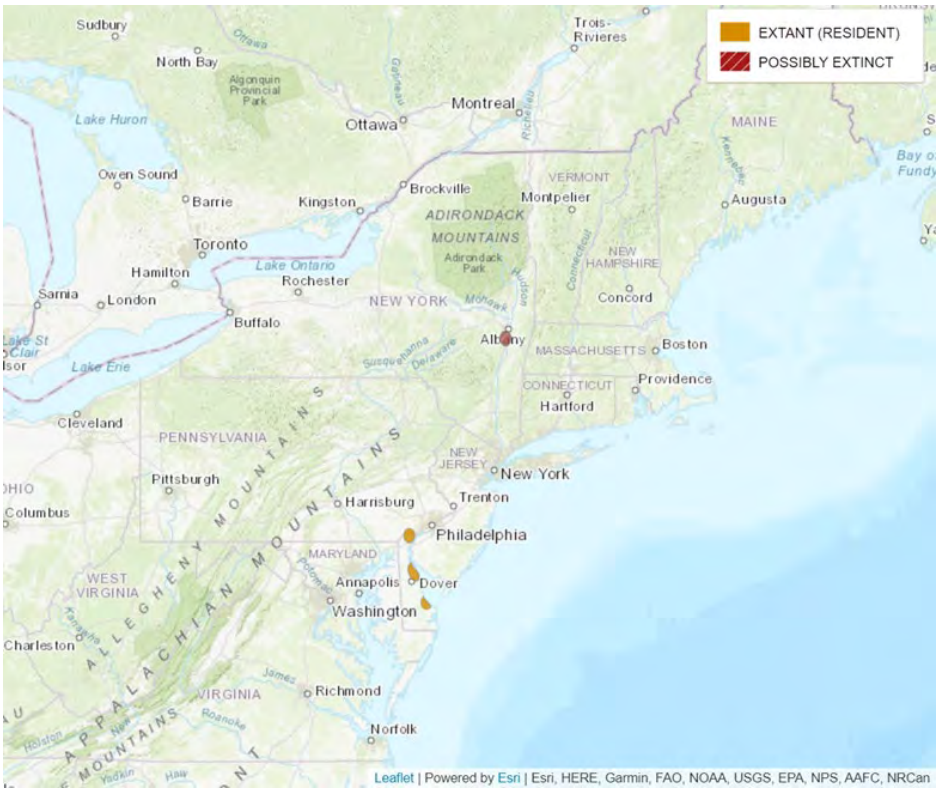

Figure 2: *IUCN Red List map of Photuris pyralomima North American distribution (Hecksher and Walker 2021).*

Figure 3: *Photuris pyralomima regional distribution as reported at* *https://northeastwildlifediversity.org/rsgcn* .

III. New York Rarity

(provide map, numbers, and percent of state occupied)

Currently, there are no records of *P. pyralomima* in NYNHP element occurrence database. Historic records and the type locality have documented *P. pyralomima* in Albany County. This single occurrence suggests that this species occurs in less than 2% of New York state. Preliminary data from the Dark Skies for Fireflies survey effort has not yet detected this species (NYNHP 2024). Flash pattern data and voucher specimens were collected in 2023 and 2024. Species determinations and verifications are currently underway.

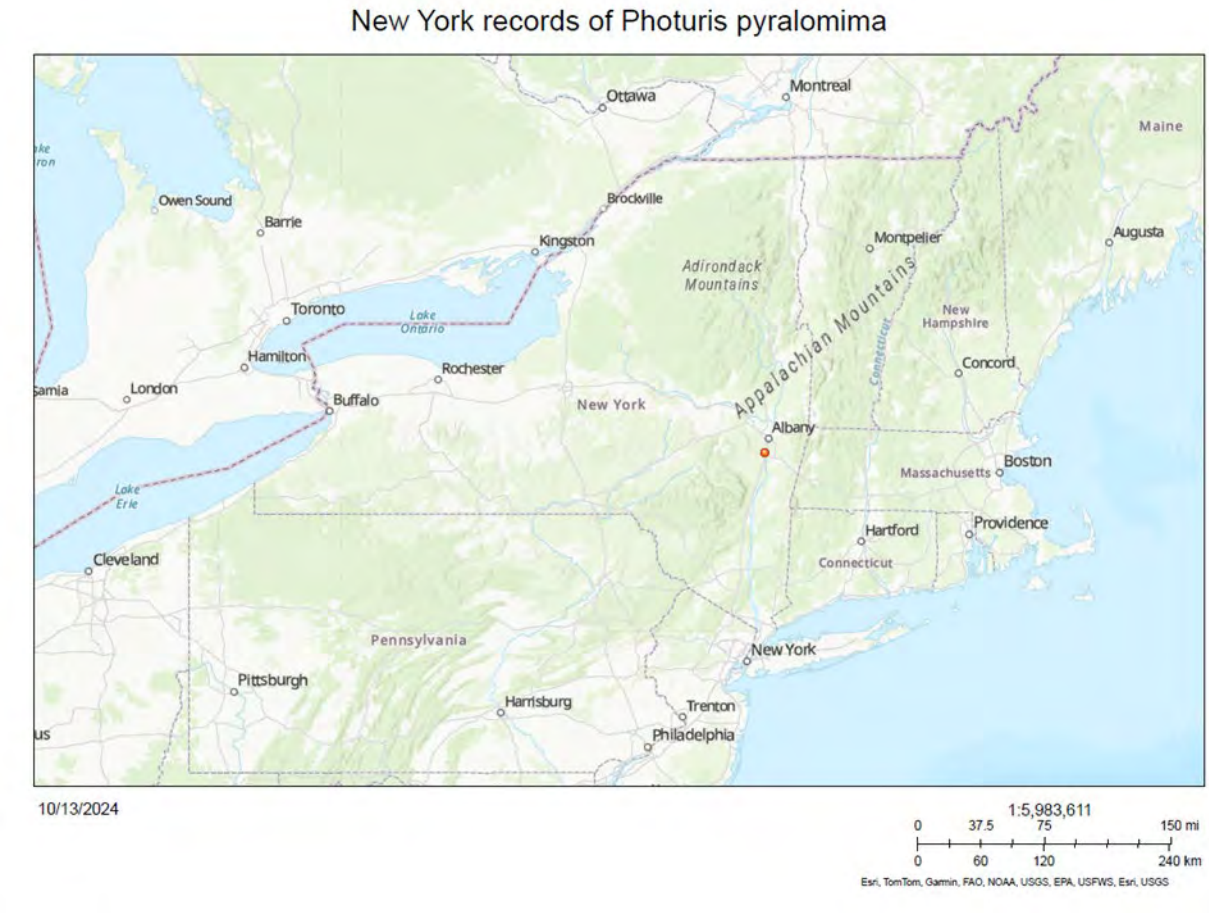

Figure 4: NYS distribution of *Photuris pyralomima* based on historic record (pre-1999) from Barber 1951. This point represents low accuracy from georeferenced location based on site, city, and county level description (NYNHP 2024).

Years	# of records	# of Counties	% of counties in State
Pre-1999	1	1	1.6
2000-present	NA	NA	NA

Table 1. Number of observations of *Photuris pyralomima* grouped by the dates known to be extant (repeat observations (element occurrences) include the years spanning first observation to last observation) and the number and percent of total of counties these observations fall within for New York State.

Details of historic and current occurrence:

Percent of North American Range in NY	Classification of NY Range	Distance to core population, if not in NY
1-25%	Peripheral	

Column options
Percent of North American Range in NY: 100% (endemic); 76-99%; 51-75%; 26-50%' 1-25%; 0%; Choose an item
Classification of NY Range: Core; Peripheral; Disjunct; (blank) or Choose an item

IV. Primary Habitat or Community Type

(from NY crosswalk of NE Aquatic, Marine, or Terrestrial Habitat Classification Systems):

NatureServe (2023) broad habitat types: Old field, Grassland/herbaceous

Habitat or Community Type Trend in New York

Habitat Specialist?	Indicator Species?	Habitat/ Community Trend	Time frame of Decline/ Increase
Unknown	Unknown	Unknown	Unknown

Column options
Habitat Specialist and Indicator Species: Yes; No; Unknown; (blank) or Choose an item
Habitat/Community Trend: Declining; Stable; Increasing: Unknown; (blank) or Choose an item

Habitat Discussion:

IUCN Red List (Heckscher and Walker 2021):

Photuris pyralomima is generally found in open habitats including moist meadows, hayfields, and fields with dense scrub-shrub vegetation, such as those that have been left to fallow (Heckscher 2010).

V. Species Demographics and Life History

Breeder in NY?	Non-breeder in NY?	Migratory Only?	Summer Resident?	Winter Resident?	Anadromous/ Catadromous?
Yes	Yes	No	Yes	Yes	No

Column options
First 5 fields: Yes; No; Unknown; (blank) or Choose an item
Anadromous/Catadromous: Anadromous; Catadromous; (blank) or Choose an item

Species Demographics and Life History Discussion

(include information about species life span, reproductive longevity, reproductive capacity, age to maturity, and ability to disperse and colonize):

IUCN Red List (Heckscher and Walker 2021):

Males emit a single, yellowish, half second flash-glow every 6 seconds to attract females (Barber 1951). Females are probably predatory like other species in the versicolor group within this genus (Faust 2017). Larvae of some species in this genus are dietary generalists, scavenging around damp areas at night looking to consume snails, worms, other soft-bodied invertebrates, and even plant material, such as berries (Buschman 1984).

VI. Threats

Threat Level 1	Threat Level 2	Threat Level 3	Spatial Extent	Severity	Immediacy	Trend	Certainty
6. Human Intrusions & Disturbance	6.1 Recreational Activities	6.1.8 Wildlife observation/photography	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
7. Natural System Modifications	7.3 Other Ecosystem Modifications	(habitat loss/degradation)	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
9. Pollution	9.3 Agricultural & Forestry Effluents	9.3.1 Nutrient loads	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
9. Pollution	9.3 Agricultural & Forestry Effluents	9.3.3 Herbicides & pesticides (runoff)	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
9. Pollution	9.6 Excess Energy	9.6.1 Light pollution	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
11. Climate Change	11.1 Habitat Shifting & Alteration	-	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.
11. Climate Change	11.4 Changes in Precipitation & Hydrological Regimes	11.4.2 Droughts	Choose an item.	Choose an item.	Choose an item.	Choose an item.	Choose an item.

Table 2. Threats to *Photuris pyralomima.*

Are there regulatory mechanisms that protect the species or its habitat in New York?

Yes:	No:	✓	Unknown:

If yes, describe mechanism and whether adequate to protect species/habitat:

Describe knowledge of management/conservation actions that are needed for recovery/conservation, or to eliminate, minimize, or compensate for the identified threats:

Threats to *P. pyralomima* include light pollution, soil and air pollution, pesticides, habitat fragmentation and destruction, and climate change (Lewis et al. 2024). Minimizing these key threats are needed to conserve at-risk firefly species. In addition, Reed et al. (2020) found that fireflies have numerous risk factors that can contribute and make them more susceptible to various threats, including specialized diets, poor dispersal abilities, and unique mating signals and behaviors.

Artificial lights can impair firefly communication resulting in reduced courtship and mating (Faust et al. 2012). Even low levels of light pollution can reduce reproductive success (Owens et al. 2022). Light pollution can be managed by turning off unnecessary lights and planting hedgerows or trees around occupied sites to block trespassing light. Pesticide exposure can reduce fitness and cause mortality, especially in the long-lived, ground-dwelling larval life stage. Runoff or direct exposure of insecticides, herbicides, and fertilizers may degrade firefly habitat and can have lethal and sublethal effects on fireflies (Lewis et al. 2024). Sublethal effects can include changes in the midgut, body convulsions, persistent glow, and other physiological changes (Wang et al. 2022). Indirect effects include contaminating and reducing available prey.

Habitat loss and degradation is another leading threat to firefly populations. While some fireflies are generalists, like the common *Photinus pyralis* (Big Dipper Firefly), others are habitat specialists and are restricted to specific conditions. Once unique habitats – such as wetlands and mature forests – are lost, fireflies may experience direct mortality or be unable to recolonize an area that has been converted or developed. Climate Change can result in more droughts, wildfires, floods, sea-level rise, etc. all of which can potentially negatively impact fireflies in all life stages. Maintaining the natural hydrology of a site will benefit firefly populations.

Overtourism can lead to development and trampling. Impressive firefly light shows can draw large crowds that may increase onsite light pollution or trample individuals and habitat (Lewis et al. 2024). While programing and education/outreach surrounding these species can increase insect conservation and awareness, care should be taken at known sites to limit access areas and light use during breeding.

Additional conservation actions to support at-risk firefly populations include reducing light pollution that spills into parks or other sensitive areas, eliminate the use of broad-spectrum insecticides, modify mosquito control programs to minimize risk to fireflies, and protect wetland and riparian habitat from recreational activities (Lewis et al. 2024).

Table 3. Recommended conservation actions for *Photuris pyralomima*.

Action Category	Action	Description
A.1 Direct Habitat Management	A.1.0.0.0 Direct Habitat Management	Site/Area management
A.2 Direct Species Management	A.2.0.0.0 Direct Species Management	Invasive/problematic species control
B.3 Outreach	B.3.1.0.0 Outreach, communication, and distribution	Awareness & Communications
C.6 Design and Plan Conservation	C.6.0.0.0 Design and plan conservation.	Site/Area protection
C.6 Design and Plan Conservation	C.6.0.0.0 Design and plan conservation.	Resource/Habitat protection
C.6 Design and Plan Conservation	C.6.5.1.3 Develop a conservation, management, or restoration plan for protected private lands	Habitat and natural process restoration
C.7 Legislative and Regulatory Framework or Tools	C.7.1.3.0 Create, amend, or influence regulation	Regulations
C.7 Legislative and Regulatory Framework or Tools	C.7.2.1.0 Create or amend policies	Policies
C.9 Education and Training	C.9.2.0.0 Training and individual skill development	Training

VII. References

This SSA drew heavily from these resources:

Heckscher, C. and Walker, A. 2021. *Photuris pyralomima*. *The IUCN Red List of Threatened Species* 2021: e.T164045819A166771493. https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T164045819A166771493.en. Accessed on 13 October 2024.

New York Natural Heritage Program, State University of New York College of Environmental Science and Forestry. 2023. Element Occurrence and Element Dataset. Albany, New York. [Exported 12/14/2023].

NatureServe. 2023. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. http://www.natureserve.org/explorer. [Accessed 12/14/2023].

Additional references:

Barber, H.S. 1951. North American fireflies of the genus *Photuris*. *Smithson. Misc. Collect.* 117: 1-58.

Buschman, L.L. 1984. Larval biology and ecology of *Photuris* fireflies (Lampyridae: Coleoptera) in Northcentral Florida. *Journal of the Kansas Entomological Society* 57(1): 7-16.

Fallon C.E., Walker A.C., Lewis S., Cicero J., Faust L., Heckscher C.M., et al. 2021. Evaluating firefly extinction risk: Initial red list assessments for North America. PLoS ONE 16(11): e0259379. https://doi.org/10.1371/journal.pone.0259379

Faust, L.F. 2017. Fireflies, Glow-worms, and Lightning Bugs: Identification and natural history of the fireflies of the eastern and central United States and Canada. The University of Georgia Press. Athens, Georgia. 356 pp.

iNaturalist community. 2023. Observations of *Photuris pyralomima* from North America. Exported from https://www.inaturalist.org [Exported 12/14/2023].

Heckscher, C.M. 2010. Delaware *Photuris* fireflies (Coleoptera: Lampyridae): New state records, conservation status, and habitat associations. *Entomological News* 121(5): 498-505.

Lewis, S.M., W.F.A. Jusoh, A.C. Walker, C.E. Fallon, R. Joyce, and V. You. 2024. Illuminating firefly Diversity: Trends, Threats, and Conservation Strategies. Insects 2024, 15, 71. https://doi.org/10.3390/insects15010071

Lloyd, J.E. 2018. *A naturalist's long walk among shadows: of North American Photuris - patterns, outlines, silhouettes… echoes*. Self-published, Gainesville, FL.

NYNHP. 2024. Unpublished firefly database. Compiled by New York Natural Heritage Program, State University of New York College of Environmental Science and Forestry. Albany, New York. [Exported 10/13/2024]

Owens, A.C.S., M. Van Den Broeck, R. De Cock, and S.M. Lewis. 2022. Behavioral Responses of Bioluminescent Fireflies to Artificial Light at Night. Front. Ecol. Evol. 10, 946640.

Reed, J.M., A. Nguyen, A.C.S. Owens, and S.M. Lewis. 2020. Linking the seven forms of rarity to extinction threats and risk factors: an assessment of North American fireflies. Biodiversity and Conservation. Volume 29: 57-75.

RSGCN. 2023. Regional Species of Greatest Conservation Need. Northeast Fish and Wildlife Diversity. Online database. Available at: https://test.northeastwildlifediversity.org/rsgcn

Terwilliger Consulting, Inc. and the Northeast Fish and Wildlife Diversity Technical Committee. 2023. Northeast Regional Conservation Synthesis for 2025 State Wildlife Action Plans. Northeast Association of Fish and Wildlife Agencies, Washington, D.C.

Wang, Y., C. Cao, and D. Wang. 2022. Physiological Responses of the firefly *Pyrocoelia analis* (Coleoptera: Lampyridae) to an Environmental Residue from Chemical Pesticide Imidacloprid. Front. Physiol. 13, 879216.

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