

# Species Status Assessment

**Common Name:** Dot-dash Firefly

**Date:** 2024-10-13

**Scientific Name:** *Photuris pensylvanica*  
Henschell

**Updated By:** Katie Hietala-

**Class:** Insecta

**Family:** Lampyridae

## **Species Synopsis**

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

*Photuris pensylvanica*, also known as the Dot-dash Firefly, is a high-quality tidal and non-tidal freshwater wetland habitat specialist. This species is member of *Photuris versicolor* group which can be extremely challenging to identify due to plasticity in flash pattern and morphology. For some time, *P. pensylvanica* was the catch all name for many observed fireflies in the *Photuris* genus which has created confusion in collections and literature. *Photuris pensylvanica* is a distinct species that is a habitat specialist and rare (Faust 2017, Heckscher and Walker 2021). *Photuris pensylvanica* is currently listed as Vulnerable by the IUCN Red List Firefly Specialist Group and has likely experienced decline from rapid development along the coast where high quality freshwater wetlands and marshes previously occurred (Heckscher and Walker 2021). Across its range, this species has been assessed as having a decreasing population trend (Heckscher and Walker 2021).

*Photuris pensylvanica* is primarily known from the mid-Atlantic region. In New York, Lloyd (2018) has observed this species in Suffolk County, McDermott (1967) observed it in Madison County, and Leconte (1881) described *P. pensylvanica* from New York; however, specific location information is unavailable for Leconte's account. Preliminary data from the Dark Skies for Fireflies project may have confirmed this species presence in Suffolk County (NYNHP 2024). In New York, this species is typically active from June through July (Faust 2017).

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. pensylvanica*, 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: G3 \_\_\_\_\_

ii. New York: SNR \_\_\_\_\_ **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: Vulnerable

-Northeast Regional SGCN: RSGCN

### Status Discussion:

*Photuris pensylvanica* has been assessed by the IUCN Red List Firefly Specialist Group as Vulnerable (VU) and as having a decreasing population trend (Heckscher and Walker 2021). This species is a habitat specialist of high quality tidal and non-tidal freshwater wetlands, such as shrub and forest acidic seepage swamps, emergent marshes, fens, fresh-water tide marshes, and floodplains (Heckscher 2010). In New York, this species appears to be restricted to Long Island and potentially central New York. It is currently known from at least two counties, Suffolk and Madison. Delaware is the only U.S. state with a state conservation rank for this species and *P. pensylvanica* has been assessed as Critically Imperiled (S1) (NatureServe 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	SNR	No
Connecticut	No	-	-	-		
Massachusetts	No	-	-	-		
New Jersey	Yes	Unknown	Unknown	Unknown	SNR	No
Pennsylvania	Yes	Unknown	Unknown	Unknown	SNR	No

Region	Present?	Abundance	Distribution	Time Frame	Listing status or S-Rank	SGCN?
Vermont	No	-	-	-		
Ontario	No	Unknown	Unknown	Unknown	S4	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

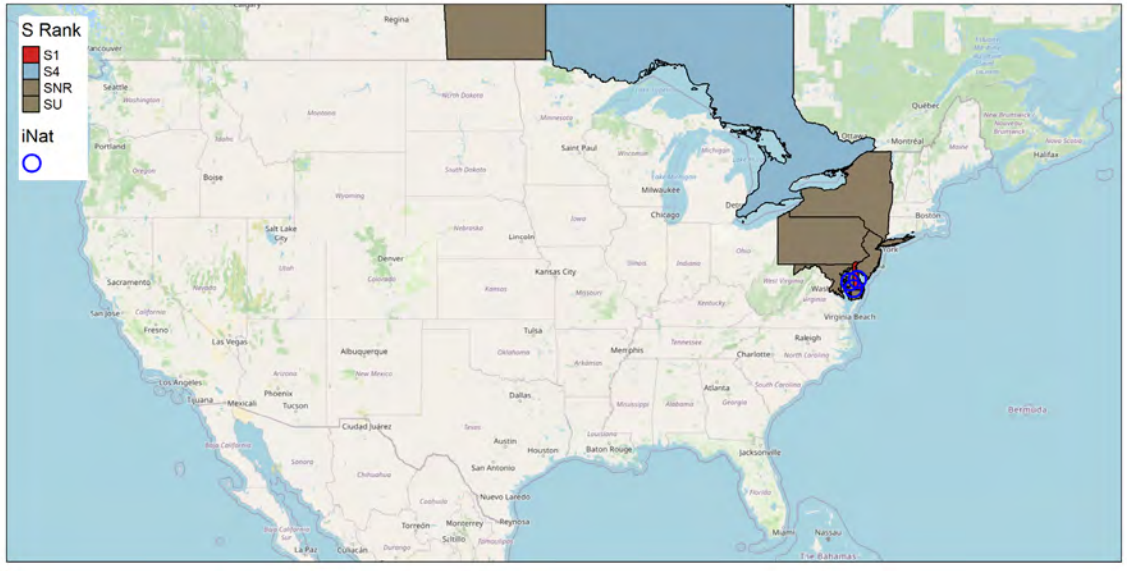
*(specify any monitoring activities or regular surveys that are conducted in New York):*

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.

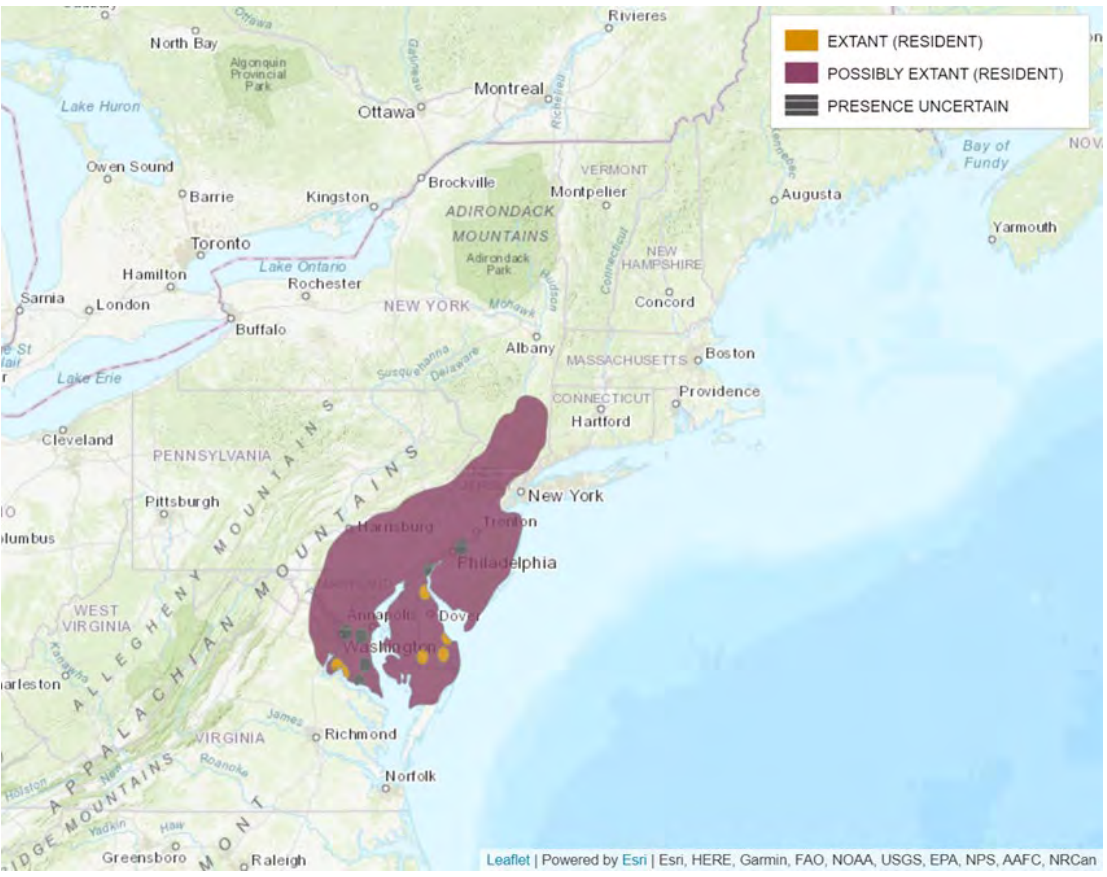
## Trends Discussion

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

The IUCN Red List assessment lists *P. pensylvanica* as Vulnerable because previously documented populations have been extirpated and habitat loss is evident (Heckscher and Walker 2021). Furthermore, it is a habitat specialist of high quality tidal and non-tidal freshwater wetlands and riparian floodplains (RSGCN 2023). High quality wetlands, especially those located along the coast, are threatened by climate change, pollution (RSGCN 2023), 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 pensylvanica* North American distribution. Points show research-grade iNaturalist observations (iNaturalist 2023, NatureServe 2023).



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



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

### III. New York Rarity

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

Within its range, *P. pensylvanica* can occur in open areas but prefers high-quality freshwater tide marshes, wetlands, swamps, and floodplains (Faust 2017). Currently, there are no records of *P. pensylvanica* in NYNHP element occurrence database. Available records suggest that this species occurs in approximately 3% of New York (NYNHP 2024). This species is part of the *Photuris versicolor* complex which can be difficult to differentiate without data describing an individual's flash pattern in great detail. *P. pensylvanica* has been documented Suffolk and Madison counties, however location information is somewhat vague and specific dates are not available (Lloyd 2018, McDermott 1967). Preliminary data from the Dark Skies for Fireflies project suggest that *P. pensylvanica* may still occur in Suffolk County (NYNHP 2024). Flash pattern data and voucher specimens were collected in 2023 and 2024. Species determinations and verifications are currently underway.

### New York records of *Photuris pensylvanica*



**Figure 4:** NYS distribution of *Photuris pensylvanica* based on historic records (pre-1999) primarily from McDermott 1967 and Lloyd 2018. These points represent low accuracy from georeferenced locations based on location and county level descriptions (NYNHP 2024).

Years	# of records	# of Counties	% of counties in State
Pre-1999	4	2	3.2
2000-present	NA	NA	NA

Table 1. Number of observations of *Photuris pensylvanica* 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: Bog/fen, Herbaceous wetland, Aerial. Additional suitable habitats include floodplains, fresh-water marshes, fens, emergent marshes, and shrub and forest acidic seepage swamps (Fallon et al. 2021)

### Habitat or Community Type Trend in New York

Habitat Specialist?	Indicator Species?	Habitat/ Community Trend	Time frame of Decline/ Increase
Yes	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 pensylvanica* is found in high quality tidal and non-tidal freshwater wetlands, such as shrub and forest acidic seepage swamps, emergent marshes, fens, fresh-water tide marshes, and floodplains (Heckscher 2010). It is found in the highest concentrations in coastal marshes of Chesapeake and Delaware Bays, and freshwater tidal wetlands of upstream tributaries, but can also occasionally be found in non-tidal wetlands farther inland. Due to these habitat associations, this species is considered an environmental indicator of high-quality freshwater wetlands (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):

Adults of this species can be seen in June and July. Males emit a characteristic greenish dot-dash flash pattern, comprised of a quick flash followed by a long flash that lasts up to three

seconds, while flying low over wetlands (Faust 2017). Females buried in vegetation on the ground answer the males with various flickers. Females are likely to be predatory like other species in this genus (Faust 2017). Larvae of other 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 pensylvanica*.

## 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. pensylvanica* 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). *P. pensylvanica* becomes most active after dark (Faust 2017), potentially making it more sensitive to light pollution. 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 programming 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).

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

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

## VII. References

**This SSA drew heavily from these resources:**

Heckscher, C. and Walker, A. 2021. *Photuris pensylvanica*. *The IUCN Red List of Threatened Species* 2021: e.T164045826A166771503. <https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T164045826A166771503.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:**

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.

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

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

LeConte J.L. 1881. Synopsis of the Lampyridae of the United States. Transactions of the American Entomological Society and Proceedings of the Entomological Section of the Academy of Natural Sciences. 1881/1882, Vol. 9, No. 1. Pp. 15-72.

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.

McDermott, F.A. 1967. The North American fireflies of the genus *Photuris* Dejean a modification of Barber's key (Coleoptera; Lampyridae). *The Coleopterists Bulletin* 21(4): 106-116.

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>

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.

<b>Template populated by</b>	Tim Howard
<b>Template populated on</b>	3/7/2024
<b>Originally prepared by</b>	Katie Hietala-Henschell
<b>Date first prepared</b>	10/13/2024
<b>First revision</b>	
<b>Last revision</b>	