Species Status Assessment

Common Name: Sellick's Firefly **Date:** 2024-10-15

Scientific Name: *Photuris sellicki* **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 sellicki, also known as Sellick's Firefly, is a Boreal Forest acidic peat wetland habitat specialist (Heckscher 2021). It is only known from New York and was described from Hamilton County in the central Adirondacks (Heckscher 2021). *Photuris sellicki* has not yet been assessed by the IUCN Red List Firefly Specialist Group (Fallon et al. 2022); however, it is a habitat specialist and appears to be rare (Heckscher 2021). Peatlands have been described as one of the most vulnerable wetland types and are relatively rare in the Adirondacks (Langdon et al. 2017).

This species is member of *Photuris* versicolor group which can be extremely challenging to identify due to plasticity in flash pattern and morphology. *Photuris sellicki* is a distinct species and was recently described in 2021. In New York, this species has been observed between mid-June through mid-July (Heckscher 2021).

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 species suspected to be rare or at risk, like *P. sellicki*, 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:** GU

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

Other Ranks:

-New York 2025 SGCN status: Species of Greatest Conservation Need
-COSEWIC: Not listed in Canada
-IUCN Red List: Not Evaluated
-Northeast Regional SGCN: Proposed Watchlist (NEAFWA Endemic)

Status Discussion:

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	Proposed Watchlist RSGCN	
New York	Yes	Unknown	Unknown	Unknown	SNR	No
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 sellicki is listed on the RSGCN Proposed Watchlist (Terwilliger Consulting Inc. and the Northeast Fish and Wildlife Diversity Technical Committee 2023). This species appears to be endemic to New York (RSGCN 2023) and is a habitat specialist of Boreal Forest acidic peat wetlands. It was observed in a wetland of high ecological quality (Hecksher 2021). Peatlands and other high-quality wetlands are threatened by climate change, invasive species, and development. Because these habitats are often isolated from each other, a disturbance may wipe out an entire population.

Figure 1. *Photuris sellicki* North American distribution. Points show records available from Heckscher (2021) (NYNHP 2024).

III. New York Rarity

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

Within its range, *P. sellicki* occurs in high-quality peatlands, bogs, and seepage wetlands (Heckscher 2021). Currently, there are no records of *P. sellicki* in NYNHP element occurrence database. Recent records have documented *P. sellicki* in a single location in Hamilton County. This single occurrence suggests that this species occurs in less than 2% of New York state. Fireflies that are restricted to specialized habitats tend to be more likely categorized threatened by some level of extinction and should be included as SGCN (Fallon et al. 2021).

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.

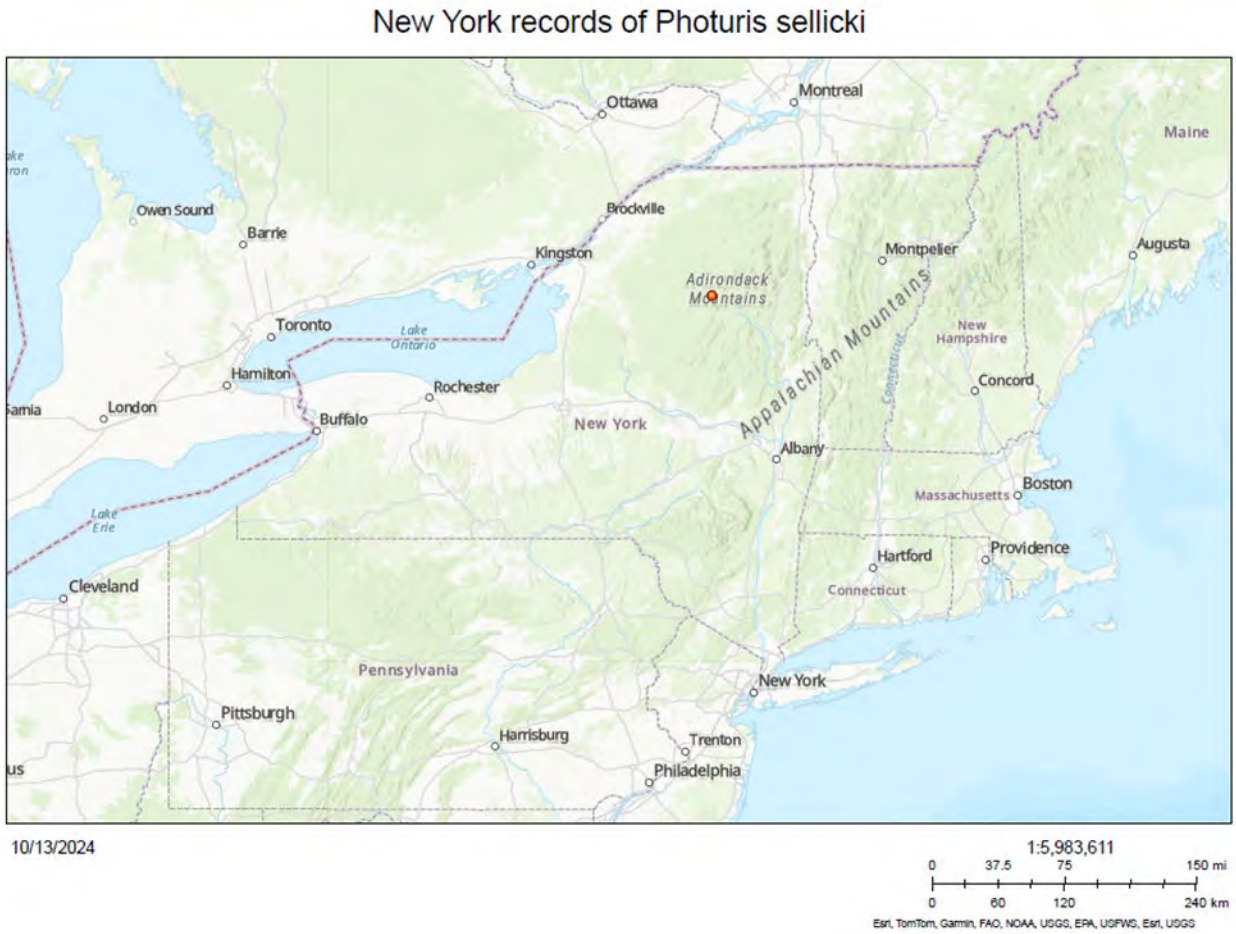

Figure 2. NYS distribution for *Photuris sellicki* based on data from Heckscher 2021 (NYNHP 2024).

Years	# of records	# of Counties	% of counties in State
Pre-1999	NA	NA	NA
2000-present	4	1	1.6

Table 1. Number of observations of Photuris sellicki 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
100%	Core	

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):

Heckscher (2021): Seepage wetland, Boreal Forest peatland seepage, Acidic peat wetland

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; Unkown; (blank) or Choose an item
Habitat/Community Trend: Declining; Stable; Increasing: Unkown; (blank) or Choose an item

Habitat Discussion:

Photuris sellicki is found in high quality Boreal Forest peatland seepage wetlands and bogs in the Adirondacks (Heckscher 2021). Due to these habitat associations, this species may be considered an environmental indicator of high-quality bogs or peatlands.

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):

Adults of this species can be seen in mid-June through July in forested boreal seepage habitats. Males emit a two-part green flash. While their flash is characteristic of this species it is also variable, typically leading with a brighter green flash and followed by a trembling or fading appearance (Heckscher 2021). The male flash typically lasting about 1.2 seconds in duration (Heckscher 2021). Females appear to answer the males with a single flash. Females are likely

to be predatory, like other species in the genus *Photuris* (Faust 2017). Adults became active well after sunset and were seen flying low over emergent vegetation (Hecksher 2021). Adults stopped flashing and flying when bright moonlight covered the wetland suggesting they are averse to bright conditions.

In general, larvae in the genus *Photuris* are dietary generalists and will scavenge around damp areas 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 sellicki.*

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. sellicki* 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. sellicki* becomes active after dark and stopped flashing and flying when moonlight lit up the occupied habitat suggesting they are averse to bright conditions (Heckscher 2021) and potentially 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 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).

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 sellicki*.

VII. 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

Fallon, C., A. Walker, S. Lewis, and S. Jepsen. 2022. State of the Fireflies of the United States and Canada: Distributions, Threats, and Conservation Recommendations. 64 pp. Portland, OR: The Xerces Society for Invertebrate Conservation. (Available online at https://xerces.org/publications/scientific-reports/ state-of-the-fireflies)

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. 2021. Four New species of North American fireflies from isolated peatlands with reference to species determination of *Photuris* Dejean (Coleoptera: Lampyridae). Northeastern Naturalist. 28(3): 277-295.

Langdon, S.F., G.J. Edinger, P.B. Hai, S. McNulty, S. Beguin, D. Patrick (eds.) E. Snizek, and L. Walrath. 2017. Detecting Climate Change in Wetlands in the Adirondack Park: Phase II A report prepared for the U.S. EPA

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

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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