

Species Status Assessment

Common Name: Marginal Firefly

Date: 2024-10-13

Scientific Name: *Pyractomena marginalis*
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):

Pyractomena marginalis, also known as the Marginal Firefly, is a wetland habitat specialist and can also be found in open grassy areas near running water. This species is known from the southern and eastern U.S. The IUCN Red List Firefly Specialist group assessed *P. marginalis* as Data Deficient with a decreasing population trend (Walker 2021). In New York, *P. marginalis* has been documented from a single county (Westchester County) (Green 1957). This species appears to be active in New York from late June through July and into early August (Faust 2017). This species can be extremely challenging to detect because it can have a short display period, as short as 15 minutes (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. marginalis*, 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: High Priority Species of Greatest Conservation Need
- COSEWIC: Not listed in Canada
- IUCN Red List: Data Deficient
- Northeast Regional SGCN: Not listed

Status Discussion:

Pyractomena marginalis has been assessed by the IUCN Red List Firefly Specialist Group as having a decreasing population trend (Walker and Pfeiffer 2021). This species is a habitat specialist of wetlands and marsh habitats with cattails (Faust 2017). In New York, this species is known from a single record in Westchester County. West Virginia is the only U.S. state with a State Conservation Rank and *P. marginalis* has been assessed as Critically Imperiled (S1) (NatureServe 2023). *Pyractomena marginalis* can occur in smaller populations, along with others in the genus *Pyractomena* which typically occur in lower numbers (Faust 2017). *P. marginalis* is suspected to be of high conservation concern (Fallon et al. 2022).

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 | | |
| New York | Yes | Unknown | Unknown | Unknown | SNR | No |
| Connecticut | Yes | Unknown | Unknown | Unknown | SNR | No |
| Massachusetts | Yes | Unknown | Unknown | Unknown | SNR | No |
| New Jersey | Yes | Unknown | Unknown | Unknown | SNR | No |
| Pennsylvania | Yes | Unknown | Unknown | Unknown | SNR | 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):

The IUCN Red List conservation status for *P. marginalis* was assessed as Data Deficient because of sporadic populations and habitat degradation (Walker 2021). This species is wetland habitat specialist and wetland habitats have experienced decline in the U.S. While large scale data sets are currently unavailable to confidently estimate trends several case studies are available. 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).

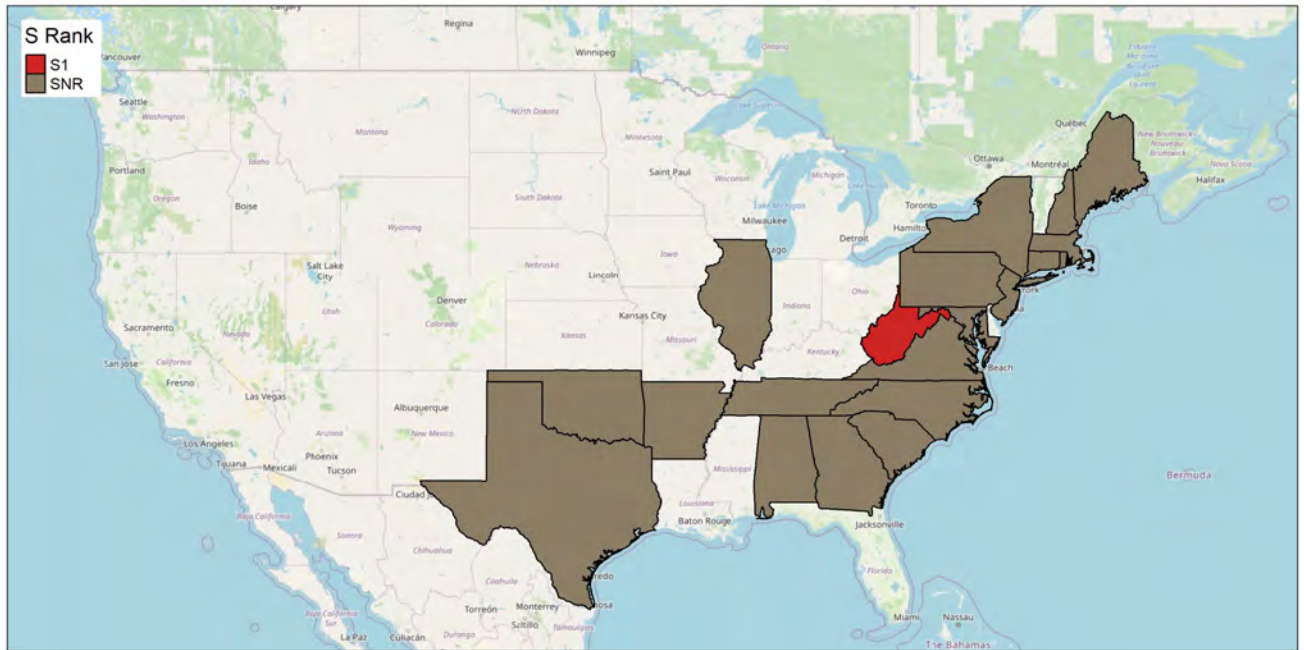


Figure 1: *Pyrractomena marginalis* North American distribution (NatureServe 2023).

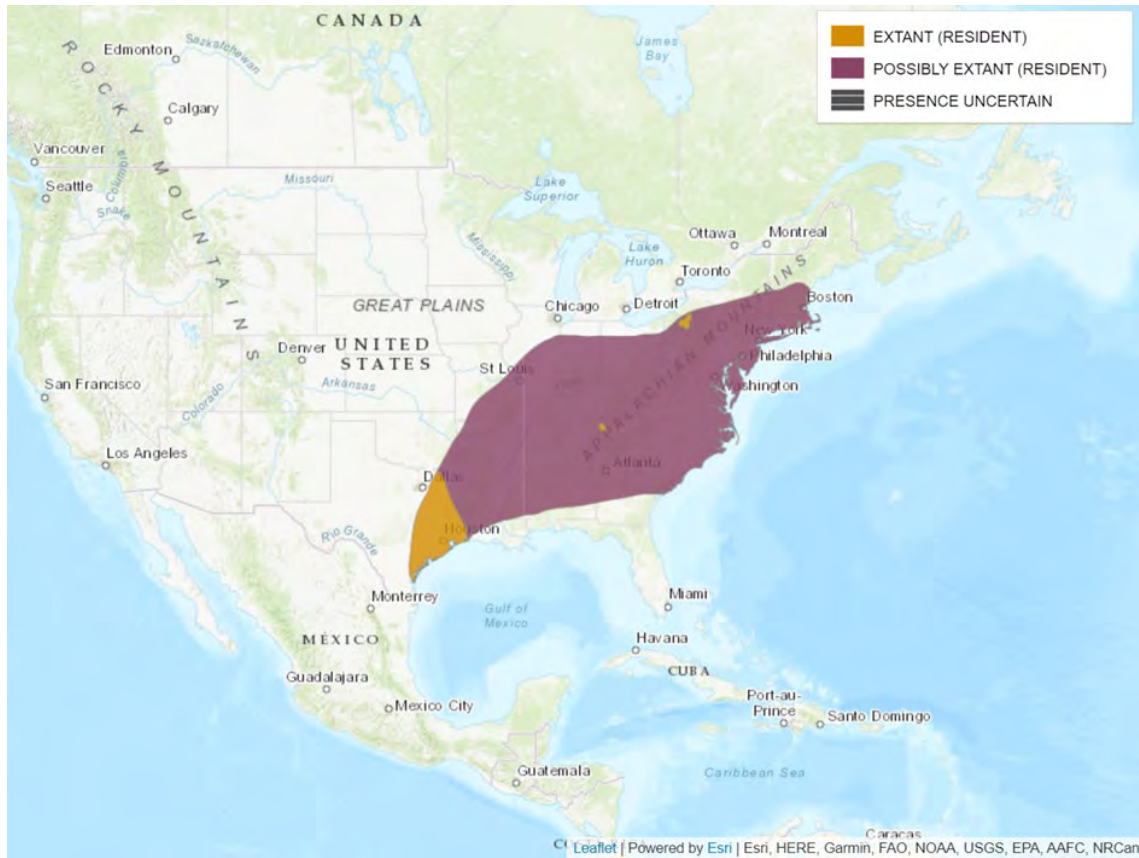


Figure 2: IUCN Red List map of *Pyractomena marginalis* North American distribution (Walker 2021).



Figure 3: *Pyractomena marginalis* 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. marginalis* prefers wetland habitat with cattails and other aquatic vegetation (Faust 2017). Currently, there are no records of *P. marginalis* in the NYNHP element occurrence database. Historic records suggest that this species occurs in less than 2% of New York (NYNHP 2024). *P. marginalis* was documented in Westchester County on June 15, 1893 (Green 1957). Preliminary data from the Dark Skies for Fireflies project observed a population that could potentially be *Pyractomena marginalis* from wetland habitat adjacent to the Hudson River in Columbia County (NYNHP 2024). A voucher specimen was collected in 2024 and species determinations and verifications are currently underway.

New York records of *Pyractomena marginalis*

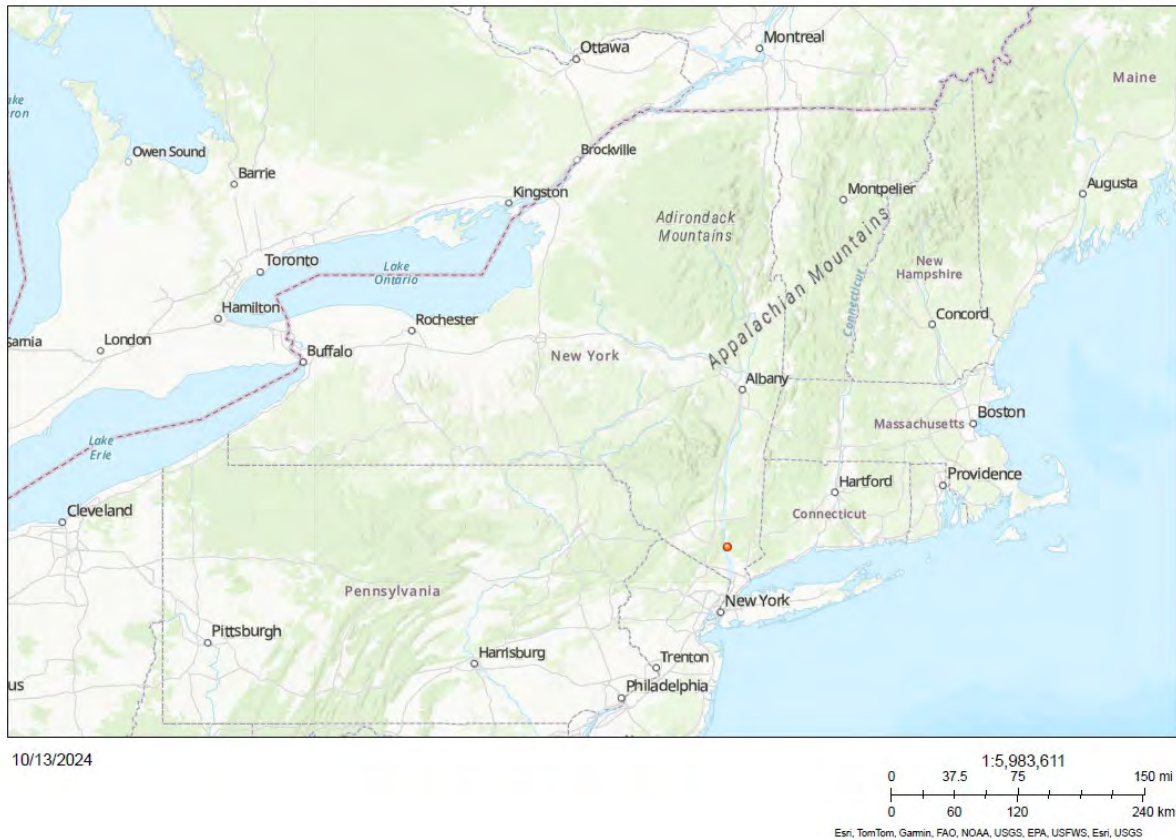


Figure 4: NYS distribution of *Pyractomena marginalis* based on a single historic record (pre-1999) from Green 1957. This point represents low accuracy from georeferenced locations based on site location and county level descriptions (NYNHP 2024).

| 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 *Pyractomena marginalis* 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: Woodland - Conifer, Grassland/herbaceous, Forest - Hardwood, Woodland - Hardwood, Forest - Mixed, Woodland - Mixed, Forest - Conifer, Riparian, Herbaceous wetland, Forested wetland, Big River, Creek, Medium River, Subterrestrial

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 (Walker 2021):

Pyrrhopyga marginalis is found in open areas, often near moving water (Faust 2017). Lloyd (2018) reports individuals from a hillside covered in the invasive Kudzu vine, as well as in a hedgerow along a wet agricultural ditch and at the side of a stream near the edge of a wooded area.

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 (Walker 2021):

Adults are active in June and July (Faust 2017). During courtship displays, males emit a single, orange-yellow flash every five to six seconds, while flying one to two metres off the ground, often in proximity to woody vegetation (Faust 2017, Lloyd 2018). This flash is similar to several other *Pyrrhopyga* species, making it difficult to distinguish in the field and lab (Faust 2017).

Many larval *Pyractomena* are known to be predacious, feeding on snails and other invertebrates (Buschman 1984, Majka 2012, Lloyd 2018). However, it is unknown what larval *P. marginalis* eat. Adults are active in June and July (Faust 2017).

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 *Pyraclomena marginalis*

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. marginalis* 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. marginalis* becomes active about 40 minutes after sunset late dusk and continues into complete darkness (Faust 2017). Being active at this time may potentially make it less 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).

Table 3. Recommended conservation actions for *Pyractomena marginalis*.

| 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:

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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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