Species Status Assessment

Common Name: Spatterdock darner **Date Updated:** January 10, 2024

Scientific Name: *Rhionaeschna mutata* **Updated By:** Erin L. White

Class: Insecta

Family: Aeshnidae

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

White et al. 2010, mostly verbatum, though some sentences are transposed: “The distributional center of the spatterdock darner (*Rhionaeschna mutata*) lies in the Appalachian Mixed Mesophytic Forest ecoregion of central Ohio, and extends northwest to northern Michigan and Wisconsin, south the Tennessee, and northeast to western Maine. A record was recently recorded from Nova Scotia (Cook and Bridgehouse 2005) but it is unclear whether this represents an established breeding population because individuals of this genus are known to wander over long distances (Beatty and Beatty 1969) and the nearest record in western Maine has not been reported since 1998 (Brunelle and deMaynadier 2005, Cook and Bridgehouse 2005).

R. mutata is the only eastern North American representative of *Rhionaeschna*, a tropical genus with the majority of species residing in South America. It was renamed from *Aeshna mutata* in 2003, and is believed to be a relict species which had colonized northward during Ecocene times over 30 million years ago, then retracted during the Miocene and Pliocene, leaving the current relict distribution (Von Ellenrieder 2003). Since many locales in the eastern U.S. have obviously been colonized post-glacially (Beatty and Beatty 1969), some have suggested that the species range continued to expand northward (Cook and Bridgehouse 2005). The temporal pattern of distribution in New York seems to support this scenario, as the species was not known in the state until it was collected from Cinnamon Lake in the Southern Tier in 1939; this population was still extant in 2005. Records were not added again until the late 1980s, when additional southern tier sites were located. During the 1900s, it was discovered at several locations in southeastern New York. During the New York State Dragonfly and Damselfly Survey (NYDDS), the range of *R. mutata* continued to expand west and northward to Montgomery County— currently one of the northernmost extant locales in the northeast (Donnelly 2004). This pattern could be the result of increased survey effort, however, no new locales were added during recent atlas efforts in Maine (Brunelle and deMaynadier 2005) and despite increased survey efforts, it has not been observed north of extreme southwest Ontario since the mid-1980s (Ontario Natural Heritage Information Centre 2010). The 2007 record in Chautauqua County was not unexpected, as several records are known from nearby Pennsylvania and Ohio (Donnelly 2004).

R. mutata is a lentic generalist and the habitat has been described as “fishless ponds, usually with water lillies” (Dunkle 2000) or “vegetated ponds and pools, open marshes and bogs, often with spatterdock” such as *Nuphar* or yellow water lily. Typical New York locations are small, shallow ponds with abundant emergent and submerged vegetation which sometimes, but not always, includes spatterdock. Many of the occupied waterbodies are heavily vegetated, older, man-made ponds where *R. mutata* co-occurs with a large suite of more common Odonata (Shiffer and White 1995, Roble 1999). It is unknown whether New York sites for this species contain fish (New York Natural Heritage Program 2009).

I. Status

a. Current legal protected Status

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

ii. **New York:** Not Listed

b. Natural Heritage Program

i. **Global:** G4

ii. **New York:** S2 **Tracked by NYNHP?:** Yes

Other Ranks:

-NYS 2025 SGCN Status: Species of Greatest Conservation Status
-IUCN Red List: Least Concern
-Northeast Regional Rank (White et al.2015): R4 Vulnerability, Primary Responsibility

Status Discussion:

White *et al.* (2010) calculated a revised draft S-rank of S2S3 from S2. Based on rarity, trend, and threat information, this species should remain an SGCN.

II. Abundance and Distribution Trends

Region	Present?	Abundance	Distribution	Time Frame	Listing status	SGCN?
North America	Yes	Unknown	Unknown	Last assessment US 2004; Canada 2011		-
Northeastern US	Yes	Unknown	Increasing	Pre and post 2000	R4; Watchlist	No
New York	Yes	Unknown	Increasing	Pre and post 2005	S2; SGCN	Yes
Connecticut	Yes	Unknown	Unknown		S2	No
Massachusetts	Yes	Unknown	Unknown		S3; SC; SGCN	Yes
New Jersey	Yes	Unknown	Unknown		S3; SGCN	Yes
Pennsylvania	Yes	Unknown	Unknown		S3; SGCN	Yes
Vermont	Yes	Unknown	Unknown		S1; SGCN	Yes
Ontario	Yes	Unknown	Unknown		S3	-
Quebec	No data	-	-		SNR	-

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 New York State Dragonfly and Damselfly Survey (NYDDS) was conducted from 2005-2009. Some sites are on protected lands and are surveyed as part of inventory by Heritage staff as part of OPRHP or State Lands projects.

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

Recent survey efforts have expanded the known range of this species into northern NY and the suggested trend is stable to increasing in NY. The number of records since 2005 could be indicative of increased survey efforts and increased use of iNaturalist (iNaturalist 2024, White *et al.* 2010). Several of the pre-2005 and even early NYDDS sites have been revisited, though the species has not been documented at many of them in recent years. The species may undergo meta-population dynamics, may be moving northward, may no longer have suitable habitat at older sites, or may not have been breeding at some of the previously known locations, or some combination of these factors. It seems likely that at least some occupied sites are being lost due to changes in hydrology and water quality at some lakes and ponds across the species' state range (NYNHP 2024b). It does appear to at least be stable in NY and the records suggest possibly increasing. This is a large, showy dragonfly that would peak interest from the public and is easily identified by photograph, making iNaturalist a useful tool for confirming sightings. What is more difficult to discern is whether any new observations from iNaturalist would represent breeding locations.

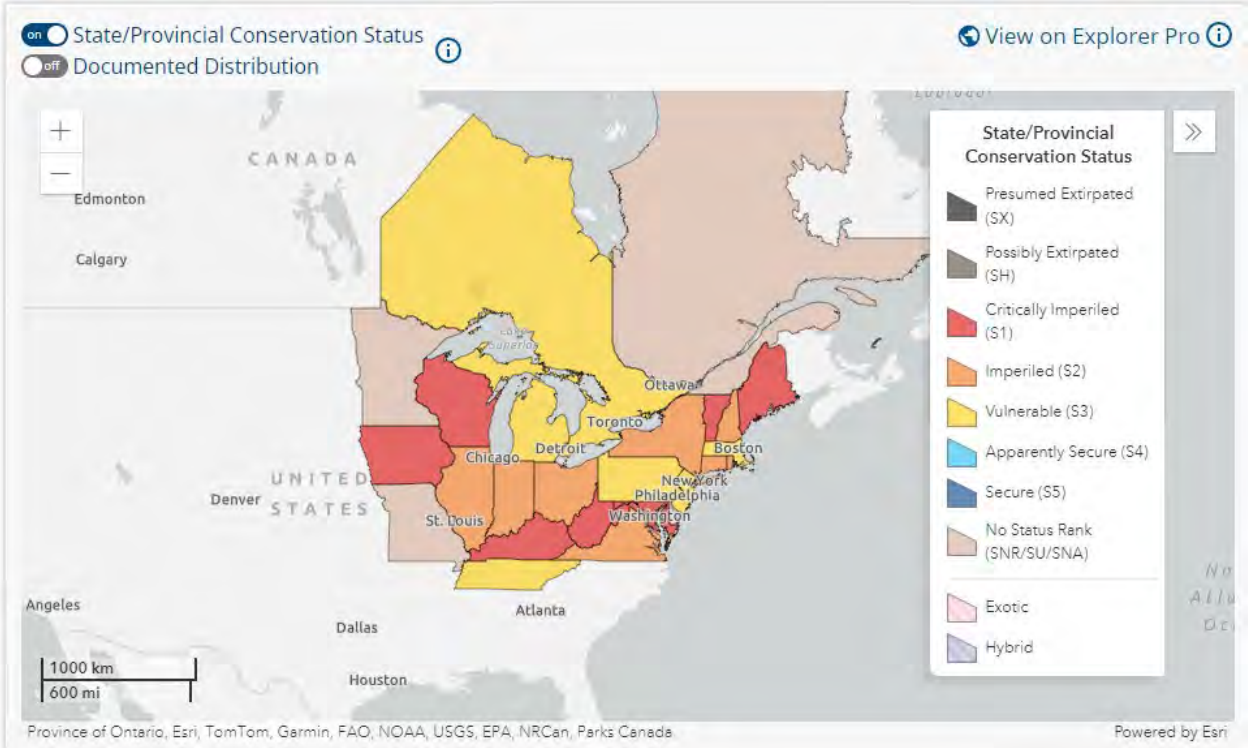

Figure 1. Conservation status of the Spatterdock Darner in North America (NatureServe 2024).

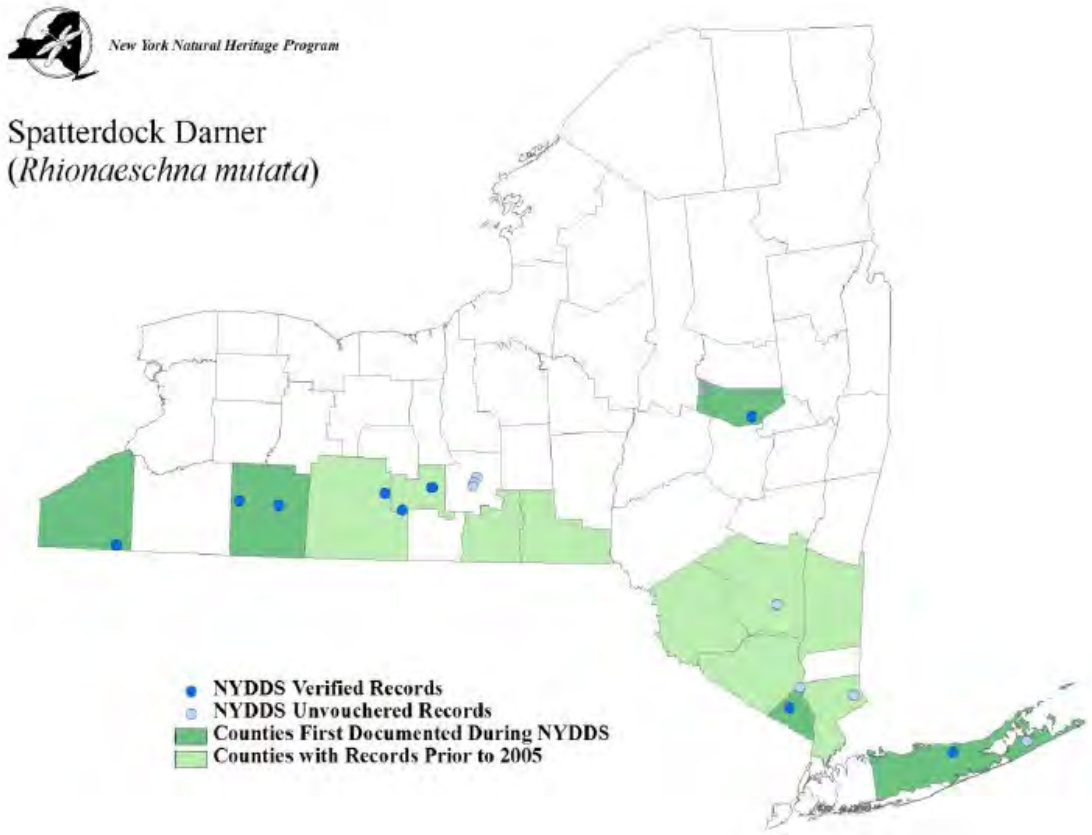

Figure 2. Occurrence record of the spatterdock darner in New York during the NYDDS (White *et al.* 2010).

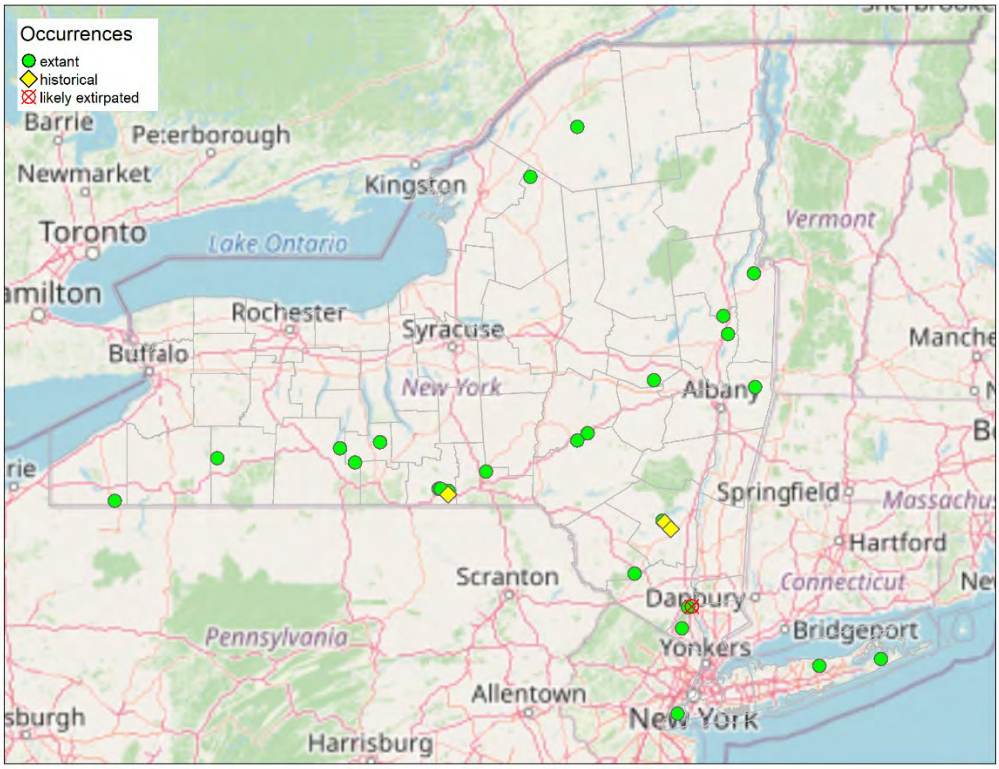

Figure 3. NYNHP element occurrence records for the Spatterdock Darner in New York (NYNHP 2024).

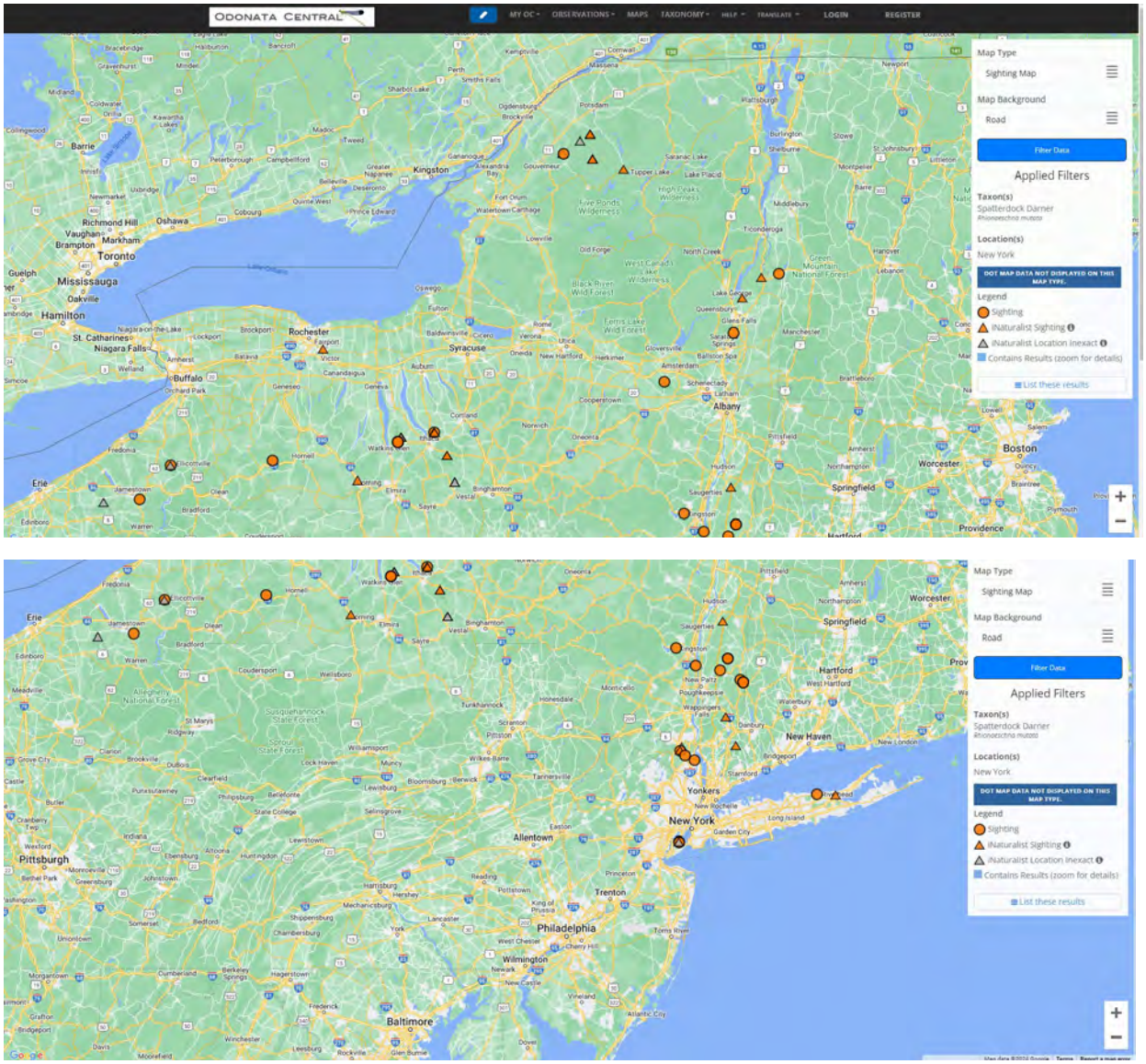

Figure 4. Distribution of the spatterdock darner in New York (Abbott 2024).

III. New York Rarity *(provide map, numbers, and percent of state occupied)*

Currently, this species has been recorded from at least 22 localities in the state. The distribution of these records is widespread and the species' principal habitat, vegetated ponds, pools and bogs (Nikula *et al.* 2003, Dunkle 2000), is also widespread, but localized. These considerations suggest that existing collection locations are not an accurate representation of the actual number of populations. However, the species is thought to be fairly local in New York and other states, and the apparent preference for fishless ponds with spatterdock may also indicate that the number of undiscovered populations may not be large (NYNHP 2024b).

Years	# of Records	# of Counties	% of State
Pre-2005	at least 9	9	~15%
2005-2009	9	7	~11%
2010-2023	25	22	~35%

Table 1. Records of spatterdock darner in New York.

Details of historic and current occurrence:

Pre-2004, Spatterdock Darners were known from nine counties in central and southern NY (Donnelly 2004). During the NYDDS, records were confirmed in seven counties statewide (Abbott 2024, iNaturalist 2024, White et al. 2010). Since 2010, there are confirmed observations from 22 counties in NY (Abbott 2024, iNaturalist 2024). As there were 57 records on iNaturalist, and the adults are easily identified by photos, I assumed these were valid records if they were labeled research grade. As many exact locations are obscured to me on iNaturalist, I am unable to determine if multiple records from a county will be the same EO (or if these are breeding locations), but can assume at least 25 EOs currently (Abbott 2024, iNaturalist 2024, NYNHP 2024). And, even with NYDDS records, it should be noted that not all of the recent locations have been documented at sites where the species is definitively breeding and overwintering (as evidenced by or site emergence or collection of exuviae).

If it occurs in 22/62 counties, that is very roughly about 35% of the state, though the occupied area of those counties would be smaller.

New York's Contribution to Species North American Range:

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

From Olivero-Sheldon and Anderson 2016:

Warm to Cool, Eutrophic, Acidic

Warm to Cool, Eutrophic, Circumneutral

Warm to Cool, Eutrophic, Alkaline

Warm to Cool, Oligo-Mesotrophic, Circumneutral

Warm to Cool, Oligo-Mesotrophic, Acidic

Warm to Cool, Oligo-Mesotrophic, Alkaline

Habitat or Community Type Trend in New York

Habitat Specialist?	Indicator Species?	Habitat/ Community Trend	Time frame of Decline/Increase
Yes	No	Declining	Habitat ranked as high-moderate vulnerability in White et al. 2015

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:

Most NY locations are small, shallow ponds with abundant emergent and submerged vegetation (White et al. 2010). “As its common name implies, spatterdock darners are associated with spatterdock (*Nuphar* spp. - also known as yellow pond lily). However, this plant is absent from some sites where *R. mutata* is found. The nymphs are aquatic, living among aquatic vegetation and debris of the boggy ponds. The adults inhabit wooded uplands and clearings” (Massachusetts NHESP 2003).

It is likely that there are particular qualities such as water depth, bottom substrate type, amount and type of aquatic vegetation, pH, and the absence of certain types of fish, that make some lakes and ponds suitable while others are not suitable (NYNHP 2024b).

V. Species Demographic, and Life History:

Breeder in NY?	Non-breeder in NY?	Migratory Only?	Summer Resident?	Winter Resident?	Anadromous/ Catadromous?
Yes	-	-	Yes	Yes	-

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 hunt along forest edges, dirt roads, and fields, often in the vicinity of the breeding wetland. Males patrol the breeding site, typically on lengthy flights several feet above the water's surface. When more than one male is present, aggressive interactions are frequent and often end with one individual chasing another high over the tree-tops out of sight. Females appear at the breeding sites only when ready to breed. They oviposit on the undersides of aquatic and emergent vegetation, especially spatterdock. The female uses the ovipositor on the underside of her eighth abdominal segment to slice into the stalks of plants where the egg is deposited. Females have also been observed ovipositing in the stems of pondweed (*Potamogeton* spp.), and the dead stalks of cattails (*Typha* spp.). The number of eggs laid by an individual is not known. The amount of time required for the development of the eggs and nymphs is also uncertain. The eggs probably hatch within 30 days, but the nymph may take as long as 3-4 years to reach maturity (Massachusetts NHESP 2003).

From White et al. 2010: "Like other darners, *R. mutata* rest by hanging vertically on tree trunks or high in the canopy, usually later in the day (Walker 1958), where they can be difficult to detect (Nikula *et al.* 2003). Populations have been reported at Ten Acre Pond in Pennsylvania in three out of every four years for over four decades, but were reduced following drought years when the pond dried up (Shiffer and White 1995). Due to an absence of nearby occupied ponds to serve as colonizers , it has been speculated that the nymphs are drought-tolerant (Beatty and Beatty 1969).

The flight season in New York has been reported to occur early June to mid-July (New York Natural Heritage Program 2009). This is somewhat shorter than in Massachusetts (Nikula *et al.* 2003) and Pennsylvania (Shiffer and White 1995), but similar to New Jersey (Bangma and Barlow 2010). Phenology data from both database records and newer NYDDS sightings shows a somewhat shorter six week flight season in New York, with 83% of records during the month of June. Late season records have been reported but may represent wind-blown vagrants (Cook and Bridgehouse 2005)."

VI. Threats *(from NY 2015 SWAP or newly described):*

From NYNHP 2024b: "Little published information is available citing specific cases of negative impacts to this species or other lake-dwelling odonates, but any activities that degrade the sensitive hydrology of these habitats would threaten populations of these species. Examples include eutrophication and changes in dissolved oxygen content, direct effects of pesticides (e.g. for mosquito control or from agricultural runoff), increases in the sediment load of the lake (such as might result from agricultural runoff or removal of vegetation from the adjacent uplands), chemical contamination by runoff of agricultural or other discharge, and acidification of lakes by airborne industrial emissions. Groundwater withdrawal is also a likely threat at suitable sites on Long Island. Removal of large areas of forest or shrub habitats adjacent to occupied lakes and ponds could also threaten populations, as these adjacent habitats are important for recently emerged adults until they reach maturity.

Any activity which might lead to water contamination, siltation, warming of waterways, or the alteration of natural hydrology could directly and indirectly impact lentic habitats and Spatterdock Darner populations. Such threats might include roadway and agricultural runoff, industrial pollution, dams, logging activities, and development (NYS DEC 2005). In addition, siltation decreases the amount of sunlight that reaches aquatic plants (EPA 2005) and lowers the quality of habitats needed for a variety of aquatic species (NYS DEC 2005). Point source pollution, such as effluents from municipal and industrial facilities, contribute to the degradation and pollution of aquatic habitats (EPA 2022, NYS DEC 2005, Mahar and Landry 2013, Strayer et al. 2004). While modern day agricultural and silvicultural practices are an important aspect of the New York State economy, it is important to consider the effects on ecosystems and species. Excessive fertilizer use can lead to algal blooms that can be deadly to aquatic life and overgrazing of livestock in fields could introduce pathogens, oxygen-demanding organics and solids, and invasive species to aquatic ecosystems (EPA 2005).

Approximately 10% of introduced, non-native species could have an impact on the health of ecosystems (McCormick et al. 2009). Invasive plants tend to outcompete native plants and can change natural processes (NYS DEC 2005). Aquatic invasive plants and animals can alter the water chemistry, change the nutrient regime, or decrease the dissolved oxygen levels. Introduced fish can alter trophic relationships resulting in changes to native fish populations and decreased water quality (McCormick et al. 2009), as well as long-term persistence issues for species evolved to live in fish-free systems.

Climate change is another threat that is likely to have lasting effects on riverine systems. Irregular weather patterns can cause extreme drought, flooding, and temperature fluctuations. Heat waves are expected to be more intense (Frankson et al. 2022). The Northeast Region of the United States is expected to experience an increase in precipitation, more frequent storms, and higher than normal temperatures (EPA 2016, EPA 2022). Precipitation is expected to increase 10% to 15% in southern New York and 15 to 20% in northern New York by 2050 (Frvankson et al. 2022). Extreme flooding can cause widespread erosion and runoff with added risk of contamination if flooding occurs at remediation sites, industrial sites, or wastewater treatment facilities (EPA 2016, EPA 2022). Temperature increases can significantly alter ecosystems. As water temperatures rise, the amount of dissolved oxygen decreases and evaporation increase potentially lowering lake and stream levels (EPA 2022). Any combination of these events could change species distributions (EPA 2022) and those that cannot adapt or migrate may be extirpated from some areas (NYS DEC 2005)."

The spatterdock darner was classified as "not vulnerable/increase likely" (IL) to predicted climate change in an assessment of vulnerability conducted by the New York Natural Heritage Program. Available evidence suggests that abundance and/or range extent within the geographical area assessed is likely to increase by 2050 (Schlesinger *et al.* 2011).

Threats to NY Populations	
Threat Category	**Threat**
1. Natural System Modifications	Dams & Water Management/Use (alteration of natural hydrology)
2. Residential & Commercial Development	Housing & Urban Areas (habitat loss)
3. Pollution	Agricultural & Forestry Effluents (runoff, pesticides)
4. Pollution	Household Sewage & Urban Waste Water (lawn care)
5. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (grass carp)
6. Invasive & Other Problematic Species & Genes	Problematic Native Species (stocking fish)
7. Energy Production & Mining	Oil & Gas Drilling (fracking)

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:

The Freshwater Wetlands Act provides protection for wetlands greater than 12.4 acres in size under Article 24 of the NYS Conservation Law. The Adirondack Park Agency has the authority to regulate smaller wetlands within the Adirondack Park.

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

From NYNHP 2024b: “Any measures to protect water quality and reduce water contamination or hydrological alteration (such as agricultural or road runoff, shoreline development, and damming) should be considered when managing for spcies that depend on aquatic habitats like Spatterdock Darners (NYS DEC 2005). Lakeshore practices such as natural buffers that promote shoreline integrity of forests and healthy stands of native emergent and floating vegetation should serve to benefit populations of this species.

There is no single recommendation for BMPs for agricultural practices, but in general, management plans should be tailored to local conditions (e.g., soils, slope, land use). Often these plans aim to reduce pollution and increase farm productivity, but incentives could also be used to encourage sustainable farming practices. According to EPA (2005), proper management typically reduces runoff by 20-90%. Consider using Integrated Pest Management (IPM) as an alternative to pesticide use. If pesticides and fertilizers are used, they should only be applied as needed, in the proper amount, and timed appropriately. In addition, livestock should be rotated to avoid overgrazing and to allow for vegetation regrowth. If needed, alternative water sources could be provided along with shade to keep animals out of sensitive areas (EPA 2005).

Public outreach is an important tool for conservation. Many of the threats to aquatic habitats and species can have direct and indirect effects to human health and recreation. In addition, outreach and incentives for various industries would be valuable. Improvements to municipal and industrial treatment facilities was noted by NYS DEC (2005) and further improvements and plans to deal with spills should continue to be encouraged.

Climate change is a global challenge and will require partnerships outside of the New York State border (NYS DEC). However, there are local actions that can help mitigate extreme weather events. Industrial and municipal infrastructure should be improved or replaced to be more resilient to flooding events (EPA 2016, NYS Comptroller 2023). Some suggested actions include installing or improving pumps to remove floodwater from facilities and installing protective structures, such as floodwalls. Ensure that existing bridges, dams, levees, seawalls, retaining walls, and wind barriers are prepared for extreme weather (NYS Comptroller 2023). Runoff and erosion severity can be decreased by installing large culverts, planting vegetation along riverbanks, and protecting and restoring wetlands (EPA 2016, NYS Comptroller 2023).

Invasive species management can be time consuming and costly. Steps should be made to reduce the likelihood of non-native species being introduced into waterways. Boat-washing stations at boat launches can reduce chances of invasive plants and animals being transported to new waterbodies. Public outreach that educates the anglers about the risk of releasing unused baitfish would be beneficial. If there are vulnerable species present, consider a baitfish ban. Mechanical removal of some invasive plants may be needed in some rivers and streams. The use of pesticides to remove invasives can have a negative effect on ecosystems (McCormick et al. 2009) and should be a last resort to control invasive species.

Research aimed at obtaining information on population size at occupied sites would be useful in determining the overall population for this species in the state. Research on larval habitat requirements may provide a better understanding of why the species is uncommon.”

The Comprehensive Wildlife Conservation Strategy (NYSDEC 2005) includes recommendations for the following actions for odonates of lakes and ponds, and for spatterdock darner in particular.

Habitat monitoring:

____ Support and encourage habitat monitoring efforts that would complete the baseline assessment of habitat quality and threats.

Habitat research:

____ Support and encourage research projects that will help define preferred habitat in order to guide future monitoring, restoration and habitat protection efforts.

New regulation:

____ Recommendations for official state endangered, threatened, and special concern listing are an anticipated result of the statewide inventory. It is expected that one or more of these species may be recommended for listing and officially adding these species to the list would constitute a specific action.

Population monitoring:

____ Conduct surveys to obtain repeatable, relative abundance estimates for these species at known sites and newly discovered sites where access permission to conduct surveys is obtained.

Conservation Actions	
Action Category	**Action**
1. Land/Water Protection	Resource and habitat protection
2. Land/Water Protection	Site/area protection
3. Land/water management	Site/area management
4. Land/water management	Habitat & natural process restoration
5. Land/water management	Invasives/problematic species control
3. Education and Awareness	Awareness & Communications
3. Education and Awareness	Training
4. Law and Policy	Policies and Regulations

Table 3. Recommended conservation actions for spatterdock darner

VII. References

Abbott, J.C. 2006-2024. OdonataCentral: An online resource for the distribution and identification of Odonata. Available at https://www.odonatacentral.org/. (Accessed: 1/10/2024).

Bangma J. & Barlow A. 2010. NJODES; The dragonflies and damselflies of New Jersey [web application] <http://www.njodes.com/Speciesaccts/species.asp>. Accessed 30 July 2012.

Beatty, G. H. and A. F. Beatty. 1968. Origin and biogeographic affinities of Odonata fauna of Pennsylvania. Proceedings of the Pennsylvania Academy of Science 42:110-119.

Brunelle, P. M. and P. G. deMaynadier. 2005. The Maine damselfly and dragonfly survey. A final report. A report prepared for Maine Department of Inland Fisheries and Wildife (MDIFW).

Cook , C. and D. Bridgehouse. 2005. Aesha mutata Hagen (spatterdock darner) in Nova Scotia, a new provincial record, and significant range extension. ARGIA 16:5.

Donnelly, T. W. 2004. Distribution of North American Odonata. Part I: Aeshnidae, Petaluridae, Gomphidae, Cordulegastridae. Bulletin of American Odonatology 7:61-90.

Dunkle, S. W. 2000. Dragonflies through binoculars. A field guide to the dragonflies of North America. Oxford University Press, New York, New York, USA.

iNaturalist. 2024. Available from https://www.inaturalist.org. Accessed January 10, 2024.

IUCN 2024. IUCN Red List of Threatened Species. Version 2023.1. <.www.iucnredlist.org>. Accessed 10 January 2024.

Massachusetts NHESP. 2003. Massachusetts rare species fact sheets. Massachusetts Division of Fisheries & Wildlife, Westborough, MA. <http://www.mass.gov/dfwele/dfw/nhesp/species_info/fact_sheets.htm>. Accessed 31 July 2012.

Murtaugh, J. 2012. NYSDEC SWAP 2015 Species Status Assessment for *Rhionaeschna mutata* Prepared on August 2, 2012. Revised by Samantha Hoff on February 4, 2014.

NatureServe. 2024. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. <http://www.natureserve.org/explorer>. Accessed January 9, 2024.

New York Natural Heritage Program. 2007 Element distribution model for *Rhionaeschna mutata*. Albany, NY. 3-30-2010b.

New York Natural Heritage Program. 2024a. Element Occurrence Database. State University of New York College of Environmental Science and Forestry, Albany, NY.

New York Natural Heritage Program. 2024. Online Conservation Guide for *Rhionaeschna mutata*. Available from: https://guides.nynhp.org/spatterdock-darner/. Accessed January 10, 2024.

New York State Department of Environmental Conservation. (2005). *New York State Comprehensive Wildlife Conservation Strategy*. Albany, NY: New York State Department of Environmental Conservation.

Northeast Fish and Wildlife Diversity. 2024. Regional Species of Greatest Conservation Need (2023). https://northeastwildlifediversity.org/rsgcn. Accessed January 9, 2024.

Nikula, B., J. L. Loose, and M. R. Burne. 2003. A field guide to the dragonflies and damselflies of Massachusetts. Massachusetts NHESP, Westborough, Massachusetts, USA.

Olivero-Sheldon, A. and M. G. Anderson. 2016. Northeast Lake and Pond Classification. The Nature Conservancy, Eastern Conservation Science, Eastern Regional Office. Boston, MA.

Ontario Natural Heritage Information Center. 2010. Ontario Odonata atlas. Species range maps for Aeshna mutata. <http://nhic.mnr.gov.on.ca/MNR/nhic/odonates/Southern Ont/Aeshnamutata.jpg>. Accessed 31 July 2012.

Roble, S. M. 1999. Dragonflies and damselflies (Odonata) of the Shenandoah Valley sinkhole pond system and vicinity, Augusta County, Virginia. O. Banisteria 13.

Schlesinger, M.D., J.D. Corser, K.A. Perkins, and E.L. White. 2011. Vulnerability of at-risk species to predict climate change in New York. New York Natural Heritage Program, Albany, NY.

Shiffer, C. N. and H. B. White. 1995. Four decades of stability and change in the Odonata population at a ten acre pond in central Pennsylvania. Bulletin of American Odonatology 3:31-40.

Von Ellenrieder, N. 2003. A synopsis of the neotropical species of 'Aeshna' fabricus: the genus Rhionaeschna Forster (Odonata: Aeshnidae). Entomologie 146:67-207.

Walker, E. M. 1958. The Odonata of Canada and Alaska. Vol. II. The Anisoptera- four families. University of Toronta Press, Toronto, Ontario, Canada.

White, Erin L., Jeffrey D. Corser, and Matthew D. Schlesinger. 2010. The New York dragonfly and damselfly survey 2005-2009: Distribution and status of the odonates of New York. New York Natural Heritage Program, Albany, New York, USA.

White, E.L., J.D. Corser, P.D. Hunt, P. DeMaynadier, and M.D. Schlesinger. 2015. Prioritizing Odonata for conservation action in the northeastern USA. Freshwater Science (34): 1079-1093.

Originally prepared by	Jenny Murtaugh
Date first prepared	August 2, 2012
First revision	February 4, 2014 (Samantha Hoff)
Latest revision	January 10, 2024 (Erin L. White)