Asclepias variegata

White Milkweed

Asclepiadaceae

Asclepias variegata courtesy Alan Cressler, Lady Bird Johnson Wildflower Center

***Asclepias variegata* Rare Plant Profile**

New Jersey Department of Environmental Protection
State Parks, Forests & Historic Sites
Forests & Natural Lands
Office of Natural Lands Management
New Jersey Natural Heritage Program

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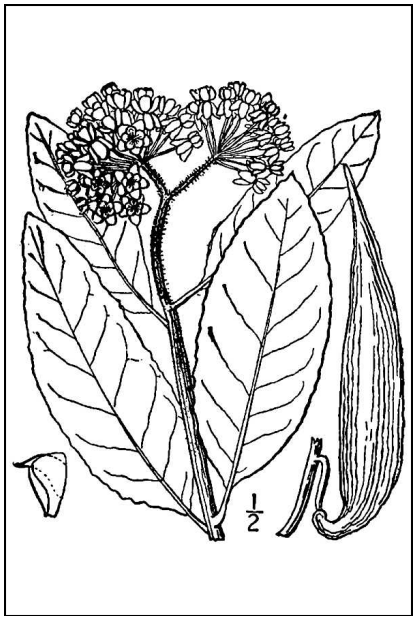
Life History

Asclepias variegata (White Milkweed) is a showy perennial herb. The milkweeds were formerly placed in Asclepiadaceae but that entire family is now included in Apocynaceae (APG II 2003). Woodson (1941, 1954) thought that *Asclepias* was an overly inclusive genus and divided it into nine subgenera, assigning *A. variegata* to subgenus *Asclepias*, series Purpurascentes. Although about a dozen other kinds of milkweed can be found in New Jersey, Barton (1818) noted that the flowers of *A. variegata* made the plants quite easy to identify. Woodson (1954) considered *A. variegata* to be one of the most beautiful *Asclepias* species, observing "*The glistening white flowers are so tightly compacted into the hemispheric inflorescences that no spaces appear between them, and the general effect is of a small snowball, with an iridescent quality imparted by the purple columns*."



Left: Britton and Brown 1913, courtesy USDA NRCS 2024a. Right: Courtesy Alan Cressler (2011), Lady Bird Johnson Wildflower Center.

Asclepias variegata has a fleshy rootstock that produces a single stem. The stems may be 3–12 dm in height (usually less than a meter) and are relatively smooth with fine lines of pubescence near the top. The leaves are arranged in pairs and they are oval in shape, typically 8–15 cm long by 4–9 cm wide. According to Agrawal et al. (2009) *A. variegata* leaves have a grayish waxy coating. White Milkweed plants generally produce 1–5 umbellate clusters of about 30 flowers although an individual umbel may contain 9–52 flowers (Betz and Lamp 1990). Milkweed flowers have an uncommon structure: In addition to the whorls of five sepals and five petals they have a five-parted corona comprised of petal-like appendages called hoods and horns that are attached to the stamens. The sepals of *A. variegata* are small (3 mm) and concealed by the larger (7–8 mm) reflexed petals, which are mainly white but usually have a dark pink or red coloration at the base that creates the appearance of a ring around the central column. The hoods and horns are also white—the former are somewhat inflated and 2.5 mm long while the latter are flattened and shorter. The mature fruit of *A. variegata* is a spindle-shaped pod 10–15 cm long and 1–2 cm

thick. (See Britton and Brown 1913, Fernald 1950, Woodson 1954, Johnson 1983, Gleason and Cronquist 1991, Weakley et al. 2022).

Many milkweeds can reproduce vegetatively but *Asclepias variegata* is a non-clonal species (Pellissier et al. 2016). Throughout its range *A. variegata* can flower from May through July (Andreas and Cooperrider 1980, Rhoads and Block 2007, Weakley et al 2022), although June and July are typical in New Jersey (Stone 1911, Hough 1983). Fruits may be present from July through September (Hough 1983, Segar 2015). During the winter months *Asclepias* pods are retained on the stems and their characteristics may aid in species identification outside of the growing season (Levine 1995).

Pollinator Dynamics

All of the flowers in an *Asclepias* umbel usually open over a period of one or two days and they are receptive to fertilization for five or six days (Betz and Lamp 1990). Milkweed flowers are pollinated by insects in a manner than is determined by their unique morphology. *Asclepias* reproductive organs (stamens and pistils) are modified and fused into a single structure (gynostegium) in the center of the corona. The five anthers are two-parted and the five stigmatic chambers where fertilization occurs are positioned between the paired anther pouches. The anthers produce a waxy ball of pollen (pollinium) inside each pouch, and the two pollinia are connected to a central clip-like organ (corpusculum) by narrow structures known as translator arms—the entire structure is called a pollinarium. Nectar produced inside the stigmatic chambers accumulates in the adjacent hoods, attracting potential pollinators. The smooth flower surfaces often cause the leg of a visiting insect to slip into a slit on the top of a stigmatic chamber, and as it attempts to become free the insect pulls its leg along the slit until it comes into contact with the corpusculum. The corpusculum attaches itself to the insect, which flies off with the entire pollinarium. The translator arms dry rapidly and bend, positioning the pollinia so that they are likely to become caught in the stigmatic slits of other flowers, break off, and remain in the chambers. (See Robertson 1886, Bookman 1981, Zomlefer 1994, Peter and Shuttleworth 2014, Eldredge 2015; the latter source includes excellent images of reproductive structures in *Asclepias*). A corpusculum may become attached to an insect's mouthparts as well as to various parts of its legs or feet, and it is not uncommon for a single insect to accumulate multiple pollinaria (Macior 1965, Betz et al. 1994, Peter and Shuttleworth 2014).

The complexity of sexual reproduction in *Asclepias* has long been of interest to botanists, although most of them have examined species other than *A. variegata*. Ulyshen et al. (2023) reported the collection of a single bee on an *A. variegata* flower but the insect was not identified in their article. Pollination of milkweeds is usually carried out by an assortment of large bees, wasps, or butterflies. Even the insects that are strong enough to be effective pollinators occasionally lose a claw or a leg segment during the process, and smaller insects that visit the flowers for nectar are often unable to extricate themselves if a body part becomes trapped in the stigmatic slit so they frequently perish in the attempt or lose a limb before withdrawing the pollinarium (Robertson 1886, Woodson 1954, Morse 1981, Kephart 1983, Betz et al. 1994, Wyatt and Broyles 1994, Fishbein and Venable 1996, Holm 2014).

The introduction of a pollinium into a stigmatic chamber does not always lead to fertilization. Successful *Asclepias* pollination requires that the pollinium be inserted in a particular orientation so that its convex side is facing the receptive surface of the chamber wall (Betz and Lamp 1990, Zomlefer 1994). Insertion of pollen from the same plant or a close relative is also likely to result in developmental failure. Self-sterility appears to be typical in milkweeds (Woodson 1954, Macior 1965, Kephart 1983) although a limited number of species are self-compatible (Wyatt 1976, Wyatt and Broyles 1994).

Hybridization between *Asclepias* species appears to be rare in nature. It has been suggested that the formation of hybrids is deterred by structural differences in the pollinia of various species (Woodson 1954, Macior 1965). Recent experimental work by Lewis and Ruter (2023) produced successful crosses between *Asclepias tuberosa* and four other milkweeds, and the authors observed that species with larger genomes were more likely to hybridize. Although *A. variegata* was not used in the cross-breeding experiments, its genome size predicted a capacity for hybridization.

Seed Dispersal and Establishment

Asclepias flowers have two ovaries—one is connected to three of the stigmatic chambers and the other is connected to the remaining two chambers—and usually only one develops into a fruit (Woodson 1954, Eldredge 2015). Very low fruit set (1–5%) is typical in milkweeds (Wyatt and Broyles 1994). Griggs (1914) observed that *Asclepias variegata* "flowered freely but fruited sparingly." Reproductive investments recorded for *A. variegata* by Betz and Lamp (1990) were 0–1 pods per stem (mean 0.24) and 88–116 seeds per pod (mean 108), and they calculated that in a population it would translate into an average of 25.9 seeds per stem. In contrast, they estimated the average productivity of Common Milkweed (*A. syriaca*) colonies at 1,123.8 seeds per stem.

Upon reaching maturity, the seedpods of *Asclepias variegata* split open along one side. The oval seeds are about 5 mm long and have a tuft of silky hairs on one end that are 2.5–4.5 cm in length (Woodson 1954). *Asclepias* seeds are dispersed by wind (Wyatt and Broyles 1994): Woodson (1954) observed that "the hairs of the coma are smooth, extremely narrow, hollow tubes of practically pure cellulose, and possess astonishing buoyancy." Dispersal of seeds from dehisced milkweed pods may occur slowly over a period of weeks or months and is facilitated by dry, windy conditions (personal observation).

No information was found regarding germination and establishment in *Asclepias variegata*. Studies of *A. syriaca* indicated that the seeds were initially dormant and required a short period of stratification (Baskin and Baskin 1977) and that germination was improved by exposure to alternating periods of lower and higher temperatures (Farmer et al. 1986). Deno (1993) noted that some *Asclepias* species have an absolute light requirement for germination while others remain indifferent to light availability. Likewise, some *Asclepias* species benefit greatly from mycorrhizal associations but others are unresponsive (Koziol et al. 2022).

Habitat

Asclepias variegata can thrive in a variety of communities, although its habitat is generally described as dry upland forests, open woodlands, or borders (Barton 1818, Woodson 1954, Hathaway and Ramsey 1973, Hough 1983, Johnson 1983, Rhoads and Block 2007, Thompson 2007, Segar 2015, Weakley et al. 2022, NJNHP 2024). A shade-tolerance evaluation by Szakacs et al. (2022) determined that *A. variegata* did not affiliate with any particular shade class association so the species was categorized as a generalist in terms of canopy openness. White Milkweed has been described as a characteristic understory herb in pine-oak forests (McVaugh 1943), oak-hickory woods (Mohlenbrock 1959), and southern mixed hardwood forests (Morris 1997): Alford (2001) noted that the species was "common in forests of all sorts." England (2014) observed that *A. variegata* sometimes occurred in prairies, and it has often been found growing along roadsides (Allard and Leonard 1943, Andreas and Cooperrider 1980, Johnson 1983, Leidolf et al. 2002, Martin et al. 2002, Marsico 2005, Hilty 2020).

Asclepias variegata has frequently been associated with sandy soils (Stone 1911, Fairbrothers and Hough 1973, Andreas and Cooperrider 1980, England 2014, Segar 2015) but it can also occur in rocky habitats (Woodson 1954, Hilty 2020). Allison and Stevens (2001) reported the milkweed in Dolomite outcrop communities, noting that it was limited to microsites where soils had accumulated to a greater depth. Although *A. variegata* nearly always grows in dry, upland settings it has occasionally been found in wetter situations. Waterfall (1949) noted its presence in an Oklahoma cypress swamp. In Arkansas, *A. variegata* was found in wet to moist pine plantations and in a forested seep (Marsico 2004, 2005). Bartram (1913) said of a former New Jersey occurrence: "Around the outskirts of the swamp where the border shades off into the more open sandy country we find *Asclepias variegata*."

Asclepias variegata appears to be somewhat tolerant of occasional disturbance. It has been documented in communities that were naturally or deliberately maintained by fire or mechanical canopy removal (Davis et al. 2002, Glitzenstein et al. 2012, Ostertag and Robertson 2012, Kleinman and Hart 2018). However the disturbance frequency at which *A. variegata* can persist is not clear. Sorrie et al. (2006) suggested that the species was intolerant of high fire frequencies, but Ulyshen et al. (2023) recently recorded it at a site that had been burned every other spring for three decades.

Wetland Indicator Status

Asclepias variegata is a facultative upland species, meaning that it usually occurs in nonwetlands but may occur in wetlands (U. S. Army Corps of Engineers 2020).

USDA Plants Code (USDA, NRCS 2024b)

ASVA

Coefficient of Conservancy (Walz et al. 2020)

CoC = 8. Criteria for a value of 6 to 8: Native with a narrow range of ecological tolerances and typically associated with a stable community (Faber-Langendoen 2018).

Distribution and Range

The global range of *Asclepias variegata* is restricted to the United States and southern Canada (POWO 2024). The map in Figure 1 depicts the extent of the species in North America.

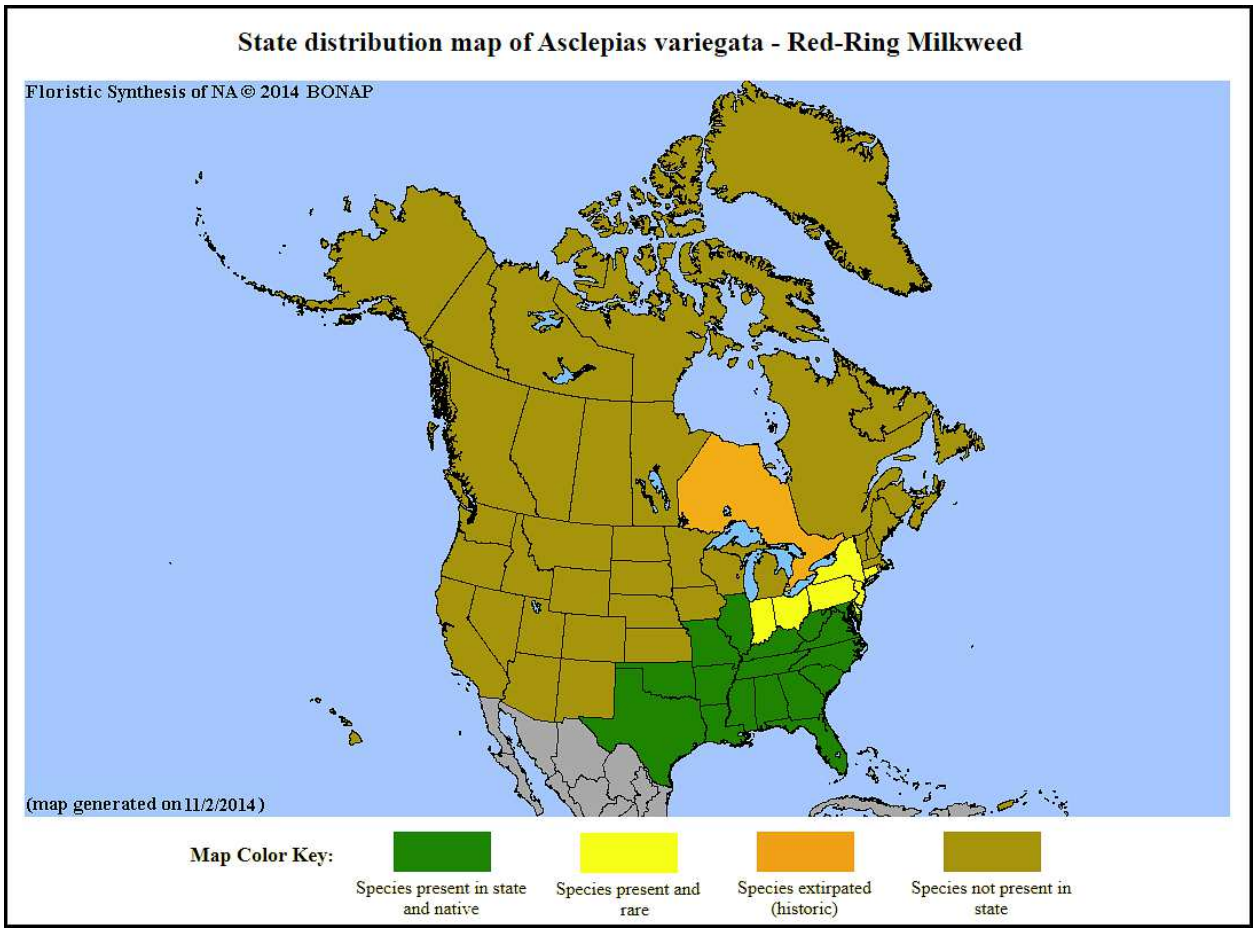


Figure 1. Distribution of A. variegata in North America, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2024b) shows records of *Asclepias variegata* in 17 of New Jersey's 21 counties: Atlantic, Bergen, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Middlesex, Monmouth, Morris, Ocean, Passaic, Salem, Somerset, Sussex, and Union (Figure 2 below). The data include historic observations and do not reflect the current distribution of the species.

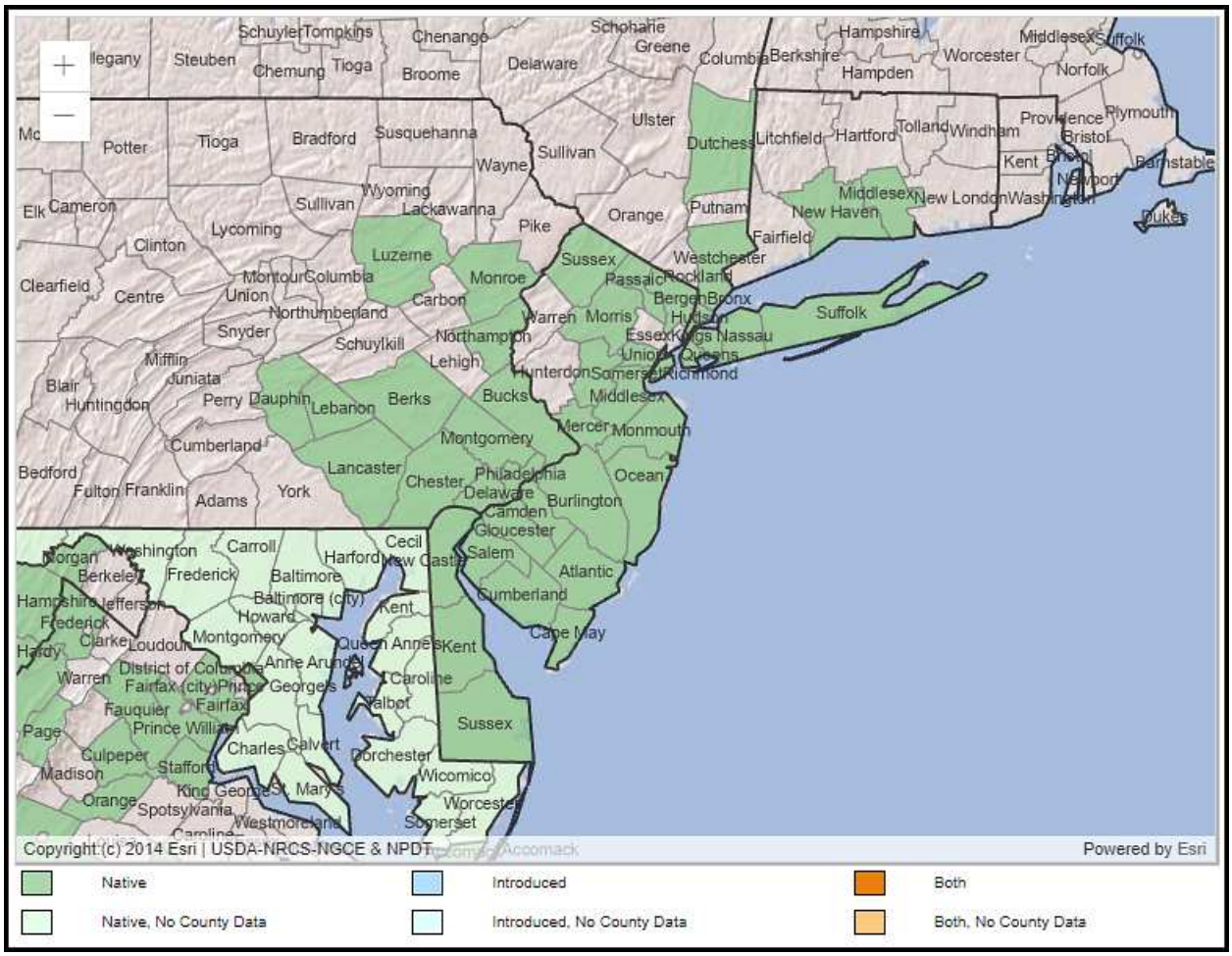


Figure 2. County records of A. variegata in New Jersey and vicinity (USDA NRCS 2024b).

Conservation Status

Asclepias variegata is considered globally secure. The G5 rank means the species has a very low risk of extinction or collapse due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats (NatureServe 2024). The map below (Figure 3) illustrates the conservation status of *A. variegata* throughout its range. White Milkweed is vulnerable (moderate risk of extinction) in two states, imperiled (high risk of extinction) in one state, critically imperiled (very high risk of extinction) in three states, possibly extirpated in Connecticut, and likely extirpated in Ontario. *A. variegata* is most likely to be imperiled in the northern part of its range: In the central and southern Unites States it is secure, apparently secure, or unranked where it occurs.

Asclepias variegata is presently ranked as a historical (SH) species in New Jersey (NJNHP 2024). A historical species was formerly documented in the state but no extant occurrences are currently known. Historically ranked taxa are considered possibly extant, and remain a conservation priority with the expectation they may be rediscovered. *A. verticillata* has also

been assigned a regional status code of HL, signifying that the species is eligible for protection under the jurisdiction of the Highlands Preservation Area (NJNHP 2010).

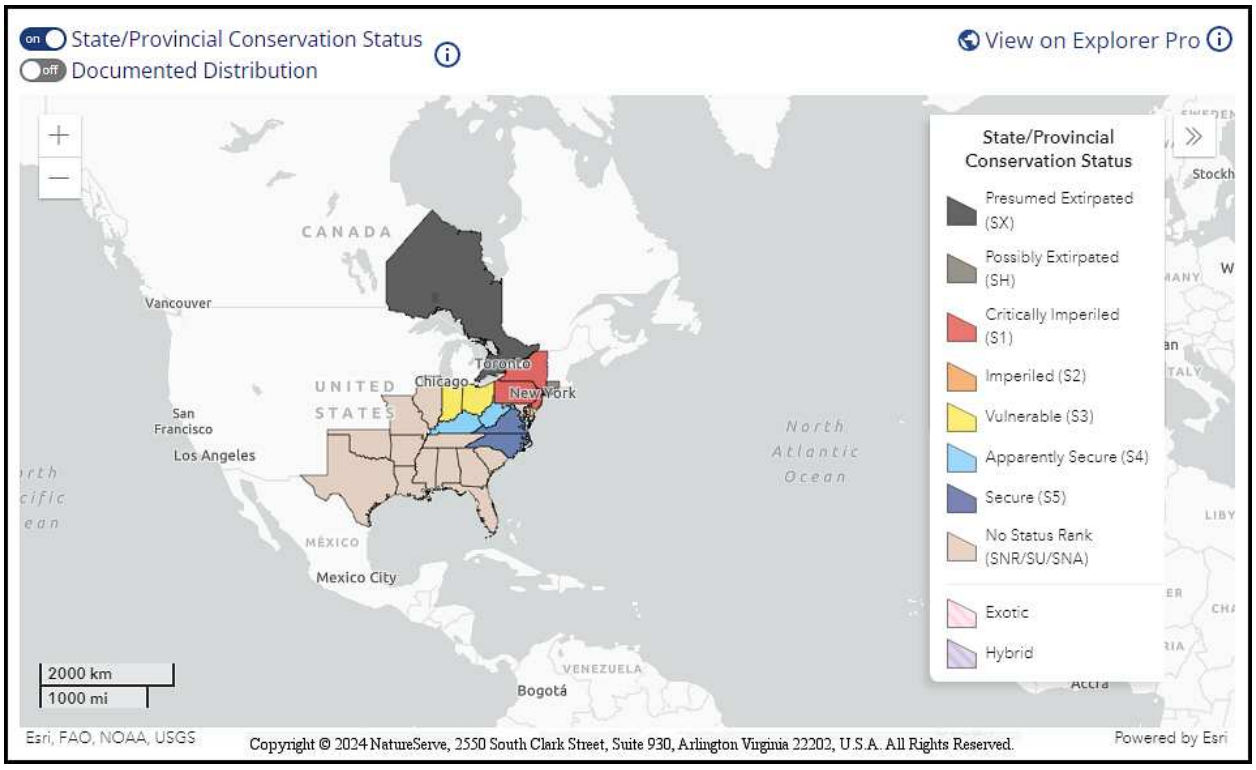


Figure 3. Conservation status of A. variegata in North America (NatureServe 2024).

Asclepias variegata was once widely collected throughout New Jersey, although most of the plants were found in the southern and central parts of the state (Britton 1889, Keller and Brown 1905, Stone 1911, Taylor 1915). Barton (1818) noted that the species was frequent in New Jersey but other authors tended to characterize it as rare (eg. Willis 1874, Britton 1881, Bartram 1913). While the occurrences were numerous they were probably small: The most recently documented populations contained less than ten plants. The vast majority of records tracked in the Natural Heritage Database were based on collections made between 1850–1950 (NJNHP 2024). By the latter part of the 1900s *A. variegata* was viewed as decreasing in New Jersey and it was ranked as endangered by Fairbrothers and Hough (1973). Occurrences were sporadically discovered in the southern counties during that period (Snyder 2000, Moore et al. 2016). At the turn of the century White Milkweed was listed as S2 (imperiled) in New Jersey, indicating that it was thought to be extant at 6–20 sites (NJNHP 2001). Recent searches have failed to find the species anywhere in the state (NJNHP 2024).

Threats

It is not clear why *Asclepias variegata* has declined in New Jersey but Griggs (1914) thought that low fruiting rates were likely to explain the relative rarity of the species near the northern edge of its range. One of New Jersey's most recently known *A. variegata* populations was probably destroyed by a fire during the late 1980s; however, the site of an older collection had been

described as "burned-over woods" (NJNHP 2024). Hilty (2020) suggested that occasional wildfires might benefit the species by reducing competitors, although no information was found regarding the competitive abilities of *A. variegata.*

While many pests and predators are probably deterred by secondary compounds (cardenolides) that are present in the sap of milkweed plants some are resistant and specialize on *Asclepias*. Examples include aphids such as the Oleander Aphid (*Aphis nerii*), larvae of the Monarch Butterfly (*Danaus plexippus*) and Milkweed Tussock Moth (*Euchaetes egle*), milkweed bugs (*Oncopeltus* spp.), and milkweed longhorn beetles (*Tetraopes* spp.). The insects generally do not cause serious harm to the plants, although the milkweed bugs can significantly damage seed pods (Agrawal 2004 & 2009, NCCE 2024). *Asclepias* species are also subject to a Trypanosomatid parasite (*Phytomonas elmassiani*) that is probably transmitted by the milkweed bugs but *A. variegata* plants inspected by McGhee and McGhee (1971) were not infected.

The bitter white sap in milkweeds would be expected to deter mammalian herbivores (Hilty 2020). Nevertheless, a study by Warren and Hurst (1981) found that *Asclepias variegata* was frequently consumed by White-tailed Deer (*Odocoileus virginianus*). Nine years of data revealed that deer use of *A. variegata* was high during the spring and summer and moderate during the fall. The overabundance of deer in New Jersey has been well-documented (eg. Maslo and Wehman 2013, NJDSR 2019), and even occasional browsing could have an outsized impact on a small plant population.

Climate Change Vulnerability

Information from the references cited in this profile was used to evaluate the vulnerability of *Asclepias variegata* to climate change in New Jersey. The species was assigned a rank from NatureServe's Climate Change Vulnerability Index using the associated tool (Version 3.02) to estimate its exposure, sensitivity, and adaptive capacity to changing climactic conditions in accordance with the guidelines described by Young et al. (2016) and state climactic computations by Ring et al. (2013). Based on available data *A. variegata* was assessed as Less Vulnerable, meaning that climate change is not expected to have a notable detrimental impact on its extent in New Jersey by 2050. Although White Milkweed is currently ranked as historic in the state, the potential for its continued presence in habitat comparable to that of previously known occurrences was considered.

Some of the effects of changing climactic conditions in New Jersey include higher temperatures, shifting precipitation patterns that increase the frequency and intensity of both droughts and floods, and rising sea levels along the coast (Hill et al. 2020). Because *Asclepias variegata* is most successful in the southeastern United States (Figure 3), rising temperatures are not expected to restrict is ability to establish or persist in New Jersey. However, due to the lack of species-specific data on many aspects of the milkweed's life history, there may be some climate-related concerns that have not yet been identified.

In response to global warming, many native plants are now blooming earlier or longer than they did in the past but *Asclepias variegata* has not changed its flowering time (Pamplin 2013,

Pamplin et al. 2016). Although the specific pollinators of *A. variegata* have not been identified, information from other *Asclepias* species suggests that bumblebees probably play an important role. A study by Pyke et al. (2016) did not find a significant change in bumblebee phenology, and since *A. variegata* blooms later in the season when the bees are already active loss of synchronicity is unlikely to be an issue anyway. A more serious problem could result from the steep declines in bumblebees that have been documented during the past two decades (Colla et al. 2008, Jacobson et al. 2018), a trend that is likely to be exacerbated by climate change (Soroye et al. 2020).

Management Summary and Recommendations

More detailed information is needed in order to do meaningful conservation planning for *Asclepias variegata* in places where the species is imperiled. Suggested topics for research include determination of the factors that limit the distribution of the milkweed at the northern end of its range, identification of pollinators, and description of the species' germination and establishment requirements. The lifespan of both seeds and established plants appears to be unknown, along with the milkweed's tolerance of competition. Although *A. variegata* has been found in some fire-prone communities, it is not clear how the species is affected by differences in the timing, frequency, or intensity of burns.

Snyder (2000) described *Asclepias variegata* as elusive. It seems reasonable to expect that the species could still be found in New Jersey based on the fact that is was previously documented in so many places. Small populations could easily be overlooked. Although detailed information is lacking regarding the location of many historic occurrences, searches of sandy woodland habitat in southern New Jersey might be fruitful. If *A. variegata* is rediscovered in the state, some consideration should be given to protecting it from browsing by deer.

Synonyms

The accepted botanical name of the species is *Asclepias variegata* L. Orthographic variants, synonyms, and common names are listed below (ITIS 2024, POWO 2024, USDA NRCS 2024b).

Botanical Synonyms	**Common Names**
Asclepias citrifolia Jacq.	White Milkweed
Asclepias hybrida Michx.	Redring Milkweed
Asclepias lindleyi Gillies ex Steud.	Variegated Milkweed
Asclepias variegata var. *major* Hook.	
Asclepias variegata var. *minor* Hook.	
Biventraria variegata (L.) Small	

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Cressler, Alan. 2011. Closeup photo of *Asclepias variegata*. Courtesy of the Lady Bird Johnson Wildflower Center, https://www.wildflower.org/. Used with permission.

Cressler, Alan. 2015. Cover photo of *Asclepias variegata*. Courtesy of the Lady Bird Johnson Wildflower Center, https://www.wildflower.org/. Used with permission.

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