Cypripedium reginae

Showy Lady's-slipper

Orchidaceae

Cypripedium reginae, courtesy Doug Sherman, Lady Bird Johnson Wildflower Center

***Cypripedium reginae* 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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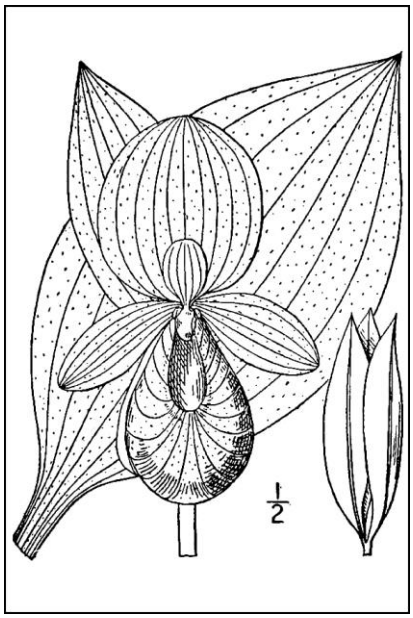
Life History

Cypripedium reginae (Showy Lady's-slipper) is a perennial orchid that is dazzling when in bloom. Baldwin (1894) remarked that upon first encountering the species he was "startled as though a gaudy cockatoo had fluttered by" and Niles (1907) likened the flowers' appearance to "fairies dancing in the twilight." As with its specific name, descriptions of the plant often invoke royalty. Fitzpatrick and Fitzpatrick (1899) referred to *C. reginae* as "the crowning glory of *Cypripediums*," Witsell (2008) entitled his account about the discovery of an occurrence "An Audience with the Queen," and Heshka (2011) agreed that the species was "indeed the most spectacular and regal of our lady's-slippers." *Cypripedium reginae* has been cultivated in Europe since the early 1700s (Cribb 1997) and it was adopted as the state flower of Minnesota in 1902 (Siegel 2012).

Cypripedium reginae is a rhizomatous plant that often forms colonies. The rhizomes are black and cylindrical and the roots are long and slender. The stems are 2–9 dm in height and have ovate, alternating leaves along their entire length. Both the stems and leaves are hairy. An inflorescence of 1–3 flowers develops at the top of the stem, subtended by a leaf-like bract. The lower petal of *Cypripedium* flowers (lip or labellum) is large and inflated, giving rise to common names like lady's-slipper or moccasin-flower. The three sepals and two lateral petals of *C. reginae* are white. The lip is usually marked with varying amounts of pink that may range from a pale hue to deep magenta. Two pollen-producing stamens are positioned behind a sterile modified stamen (staminode) which is marked with bright yellow streaks and purple dots. The fruit is a three-parted ellipsoid capsule containing thousands of tiny seeds. (See Britton and Brown 1913, Waterman 1949, Fernald 1950, Gleason and Cronquist 1991, Homoya 1993, Cribb 1997, Munroe et al. 2014, Sheviak 2020). St-Arnaud and Barabé (1989) included *C. reginae* in their detailed study of floral vasculature in the genus.



Left: Britton and Brown 1913, courtesy USDA NRCS 2025a. Right: Courtesy W. D. and Dolphia Bransford, Lady Bird Johnson Wildflower Center.

Some Showy Lady's-slippers have flowers that are entirely white. The variation occurs with enough frequency that the white-flowered plants were once thought to represent a distinct species but they are now recognized as an alternate form of *C. reginae* (Fernald and Schubert 1948). Blossoms that are morphologically atypical have also been noted at scattered locations—usually they lack a lip and have instead either two or three regular petals but other aberrations have been reported (Curtis 1941, Edens-Meier 2010, Heshka 2011). Differences in leaf size and aspect or in floral color can be induced by variation in environmental or climactic conditions (Barker 1911, Waterman 1949). *Cypripedium reginae* is not likely to be confused with any other lady's-slipper orchid in the northeastern United States. Molecular studies have shown that its nearest relatives are *C. passerinum*, which has a more northern distribution, and *C. flavum* which is native to China (Li et al. 2011, Szlachetko et al 2020). A study of genetic variability in *C. reginae* found low genetic diversity at both the species and population level (Kennedy and Walker 2007).

Reproduction in *Cypripedium reginae* is heavily reliant on vegetative growth (Owen undated). Clonal reproduction occurs slowly but the species is long-lived and when conditions are suitable the life span of an individual may exceed 50 years. A single large plant can have more than 200 flowering stems (Light 2005, NAOCC 2024). Buds for the following year's growth develop along the rhizome during late summer, elongating in the spring to produce leafy crowns. A rhizome may generate flowering and vegetative stems simultaneously. Sometimes *C. reginae* plants remain dormant, producing no aboveground shoots throughout the growing season (Waterman 1949, Curtis 1954). In a population studied by Kéry and Gregg (2004) approximately a third of the plants were dormant at some point during a ten-year period and the dormancy episodes lasted from 1–4 years.

Throughout its range, *Cypripedium reginae* can bloom between May and August (Fitzpatrick and Fitzpatrick 1899, Svenson and Rusk 1936, Hough 1983, Brackley 1985, Homoya 1993, Redmond et al. 1993, Rhoads and Block 2007, Heshka 2011, Munro et al. 2014, Breeden 2018, Sheviak 2020, Weakley et al. 2024). In New England, the onset of flowering appears to vary according to elevation (Baldwin 1894). Weather conditions may also affect flowering time: For example, a three week difference was noted in the blooming period of a *C. reginae* population in New York during two consecutive years (Burnham 1918). Flowering usually occurs over a two-week period (Vogt 1990) with individual flowers lasting for 7–14 days (Edens-Meier 2010, Owen undated). The fruits mature 5–6 weeks later. *C. reginae* leaves typically senesce by the end of September and after that the capsules dehisce (Waterman 1949).

The handling of *Cypripedium reginae* and some related species may trigger an allergic reaction. Baldwin (1894) acknowledged that he had heard about it but preferred to attribute the effects to *Toxicodendron* species which, he noted, were "generally found skulking in the same localities." Bacon (1902) described the experience of an acquaintance who had collected an armful of plants and repeatedly held an armful of them near his face to inhale their fragrance: "*The second day his entire face was badly swollen and on the fourth the swelling was so extreme that he was unable to see and later his features were so distorted as to be scarcely recognizable. The attack lasted more than two weeks*." Subsequent experimentation by Bacon confirmed that the species did indeed induce a contact rash, and a similar personal experience was related by Burnham (1918), who emphasized that he was not susceptible to *Toxicodendron* oils. The reaction to *C. reginae*

plants is triggered by substances in their glandular hairs. The toxic effect reportedly increases throughout the growing season and peaks around the time of fruit set (Cribb 1997).

Pollinator Dynamics

Lady's-slipper orchids are often described as deceitful because they use visual and olfactory cues that would typically signal the presence of a food reward to insects yet they do not offer nectar or copious amounts of pollen (Brackley 1985, Argue 2012, Pemberton 2013). The large, brightly colored flowers draw the insects' attention and as they approach they are lured in closer by a sweet scent that is produced at the base of the flowers' sepals and petals (Stoutamire 1967). Genders (1977) included *Cypripedium reginae* in his Scented Flora of the World but failed to provide a description of its odor. According to Edens-Meier et al. (2011) the fragrance is pleasant and reminiscent of bluets (*Houstonia* sp.). Vogt (1990) suggested that *C. reginae*'s bright yellow staminode with contrasting spots might mimic a pollen source. Some *Cypripedium* species attract flies by mimicking brood sites (Woodcock et al. 2014).

Cypripedium flowers are known as "trap blossoms." Many insects that enter cannot exit the way they came in due to the curvature of the lip and the presence of downward-pointing hairs so they have to find another way out (Argue 2012, Pemberton 2013). In *C. reginae*, the escape route forces the visitor to use a narrow passageway below the stigma—which scrapes pollen off of the insect's back—and then to pass the anthers which deposit fresh pollen. Most orchids have discrete pollinia that detach in units but in *Cypripedium* the pollen forms a sticky layer on the anthers and detaches in clumps upon contact (Guignard 1886, Stoutamire 1967). *C. reginae* pollen can remain viable for up to eight days after its removal (O'Connell and Johnston 1998, Proctor 1998). Argue (2012) proposed that extended pollen viability might help to compensate for fewer return visits to the unrewarding flowers.

Cypripedium reginae attracts a broad array of insects including bees, flies, butterflies, and beetles. However, cross-fertilization can only be carried out by species that are exactly the right size to fit through the exit and scrape against the relevant floral organs. Large bees and butterflies often become trapped; some find a way out but others die inside the blossoms. Small insects can pass through without ever contacting the stigma or anthers. Only a small number of medium-sized bees, syrphid flies, or beetles have been confirmed as capable of cross-fertilizing *C. reginae* and it appears that the primary pollinators vary depending on the location of the orchid populations (Guignard 1886, Barker 1911, Stoutamire 1967, Vogt 1990, Bernhardt and Edens-Meier 2010, Edens-Meier et al. 2011). The closely related *C. flavum* is also capable of using multiple pollinators: One type is more efficient but the other is more abundant (Zheng et al. 2011).

Although the structure of *Cypripedium reginae* flowers prevents them from self-pollinating, the species is self-compatible (Argue 2012). Self-fertilization can be carried out by some insects that are not the optimal size for cross-pollinating the flowers (Brackley 1985). This was first observed by Smith (1863), who watched tiny flower beetles crawling around inside *C. reginae* blossoms. Using a hand lens, he was able to detect little pollen masses attached to the insects

and to confirm that pollen had been deposited on the floral stigmas. Edens-Meier et al. (2011) noted that pollen grains were present on some of the smaller bees that visited *C. reginae* flowers.

Despite its apparent flexibility about local pollen vectors, fruit set in *Cypripedium reginae* is generally low (Brackley 1985, Bernhardt et al. 2017). The results of hand-fertilization experiments indicated that the orchid's productivity was at least partially limited by the availability of effective pollinators. Less than one quarter of the flowers in a Missouri population produced fruit, and the majority of insects that visited the orchids were non-pollinating (Edens-Meier et al. 2010, 2011). Curtis (1954) also reported a low (23%) fruiting rate in *C. reginae* flowers. Vogt (1990) noted that skippers were frequently found dead in the labellum of Showy Lady's-slipper flowers and a recent study by Hall et al. (2017) demonstrated that the presence of the dead insects could reduce fruit set.

Seed Dispersal and Establishment

The seeds of orchids lack endosperm and consist primarily of an embryo surrounded by a loose, papery coating (Dressler 1981). Individual plants produce numerous tiny propagules that are often referred to as dust seeds. The seeds of *Cypripedium reginae* are about 1 mm long and a third as wide (Arditti and Ghani 2000), and a single capsule may contain tens of thousands of seeds (Waterman 1949, Stoutamire 1964). Orchid seeds are dispersed by wind: Those of *C. reginae* have a large amount of internal air space (87%) and can remain airborne for seven seconds. Many orchid seeds also have a water-resistant outer surface that—together with the internal air space—permits flotation, enabling their movement by surface water after a rain. The seeds of *Cypripedium reginae* have been reported to float when wet. The general characteristics of orchid seeds can also allow them to be transported by adhering to animals (Arditti and Ghani 2000).

Dormancy in orchid seeds varies between species, ranging from 0–7 years (Eriksson and Kainulainen 2011). Dressler (1981) noted that the seeds of orchids may survive for long periods if they are cool and dry. *Cypripedium reginae* seeds will generally not sprout on the soil surface (Waterman 1949) and germinate best at depths of 2–5 cm (Curtis 1943). Curtis hypothesized that the species' delayed germination might be due to the period required for the seeds to work their way down into the soil. However, laboratory studies have indicated that *C. reginae* tends to germinate at irregular intervals even when the seeds are maintained in uniform conditions (Heinrich et al. 1981).

When an orchid seed germinates the embryo swells into a mass of cells called a protocorm. Once the protocorms of *Cypripedium reginae* have formed their growth pauses until the following spring when their rhizomes begin to elongate. The first aboveground shoot usually appears during the third year. The seedlings grow slowly and it can take 14–16 years for a *C. reginae* plant to produce its first flowers. However the species' rate of development is greatly influenced by local environmental conditions (Curtis 1943, Waterman 1949, Stoutamire 1964) and, as with most orchids, seedling mortality in *C. reginae* is very high (Curtis 1943, Brackley 1985).

In addition to appropriate physical conditions the germination of most orchid seeds requires moisture and, in nature, the right kind of fungi. Some species are able to germinate even when a suitable fungus is not present but a mycorrhizal association is required for further development and the seedlings remain completely dependent on their fungal partners for nutrients until they produce leaves (Dressler 1981, Rasmussen and Whigham 1993, Rasmussen 2002, Arditti and Ghani 2000). Many orchids continue to form mycorrhizae during their juvenile and adult stages but the relationships appear to become optional in some species (Whigham et al. 2008). Mature *Cypripedium reginae* plants may become completely self-sustaining (Harvais 1974), although they are likely to be supported by fungal associations during periods of dormancy (Shefferson et al. 2007).

Curtis (1939) isolated *Rhizoctonia sclerotica* from the roots of mature *Cypripedium reginae* plants but he could not entice the species' seeds to germinate in the presence of that fungus. However, he successfully used fungi isolated from other orchids (*Rhizoctonia monilioides, R. repens*) to germinate *C. reginae*. Associations with many other types of mycorrhizal and non-mycorrhizal fungi have been reported for *Cypripedium reginae*, including species of *Acremonium*, *Ceratorhiza*, *Cladosporum*, *Epulorhiza*, *Fusarium*, *Humicola*, *Hygrocybe*, *Leptodontium*, *Phialocephala*, *Trichoderma*, and *Tulasnella* (Peschke and Volz 1978, Zelmer 2001, Shefferson et al. 2007). Because *C. reginae* often co-occurs with Black Ash (*Fraxinus nigra*), Weerasuriya et al. (2022) looked for potential fungal links between the two species at a site in Newfoundland. They recorded 66 shared fungi—including arbuscular, ectomycorrhizal, ericoid, and pathogenic types—and noted that the diversity indicated the possibility of a broader multispecies nutritional network. Peschke and Volz (1978) found *Fusarium moniliforme* in newly germinated *C. reginae* seeds as well as in the roots and leaves of mature plants. Further work on the relationship between *C. reginae* and *Fusarium* has suggested that the fungus might be dispersed in tandem with the orchid's seeds and then play a role in both maintaining seed viability during dormancy and breaking down the seed coats in preparation for germination (Vujanovic et al. 2000, Vujanovic and Vujanovic 2007).

Habitat

Cypripedium reginae usually grows within 600 meters of sea level (Sheviak 2020). The orchid often occurs in alkaline soils over calcareous bedrock but it can sometimes be found in circumneutral sites (Schweinfurth 1925, Smith and Erskine 1954, Artz 1962, Fairbrothers and Hough 1973, Orzell 1983, Brackley 1985, Mehrhoff 1989, Vogt 1990, Weatherbee and Crow 1990, Brown and Ropski 1995, Johnson and Walz 2013, Breeden 2018, NJNHP 2024, Weakley et al. 2024). Wetland communities favored by *C. reginae* usually have a stable source of groundwater. Typical habitats include fens, seeps, wet meadows, prairies, bogs, and swamps (Fitzpatrick and Fitzpatrick 1899, Blair 1909, Homoya 1993, Judziewicz 2001, Rhoads and Block 2007, Ruch et al. 2013, Munro et al. 2014, Mirenda 2016, Thomas 2017, Sheviak 2020). Witsell (2008) found a vigorous clump of plants growing on the side of a limestone cliff that was kept moist by groundwater seepage. In one swampy forested site the orchids were noted to be growing both on and between the hummocks (Davis 2018).

Boggy *C. reginae* habitats may have a well-developed sphagnum layer (Friesner and Potzger 1946, Henry 1950). On open sites sedges and other graminoids are likely to be prevalent (Motzkin 1994, Breden et al. 2001). Both evergreen and deciduous forests can harbor populations of Showy Lady's-slipper. Coniferous canopy components often include *Abies*, *Juniperus*, *Larix*, *Picea*, *Thuja*, or *Tsuga* while common deciduous associates include *Fraxinus nigra*, *Toxicodendron vernix*, *Acer rubrum*, *Betula* spp. and *Populus* spp. Dogwoods (*Cornus* spp.), willows (*Salix* spp.) and Alder-leaf Buckthorn (*Rhamnus alnifolia*) are typical shrubs (Curtis 1954, Harvais 1980, Peschke and Volz 1990, Gilman and Countryman 1991, Homoya 1993, Motzkin 1994, Erskine 1997, Breden et al. 2001, Sheviak 2013, Fortney et al. 2015). Givnish (1982) observed that the stature of *Cypripedium reginae* plants allowed them to grow in places where a dense layer of herbaceous species is present.

Cypripedium reginae appears to do best when growing in moderate light conditions. Weakley et al. (2024) assigned the orchid a heliophily ranking of 4 on a scale of 1 (shade obligate) to 9 (sun obligate). In open habitats it is often found at the edges or beneath small clusters of shrubs, and in forested sites it is usually situated in gaps (Hornbeck 2005, Breeden 2018, Davis 2018). The local light regime influences the species' growth form, phenology, and reproduction (Barker 1911, Heshka 2011). Heavy shading is likely to cause a decline in *C. reginae* populations (Homoya 1993). Waterman (1949) noted that the orchid spread rapidly and extensively at a site where the forest had been cut for lumber.

Wetland Indicator Status

Cypripedium reginae is a facultative wetland species, meaning that it usually occurs in wetlands but may occur in nonwetlands (U. S. Army Corps of Engineers 2022).

USDA Plants Code (USDA, NRCS 2025b)

CYRE6

Coefficient of Conservancy (Walz et al. 2020)

CoC = 10. Criteria for a value of 9 to 10: Native with a narrow range of ecological tolerances, high fidelity to particular habitat conditions, and sensitive to anthropogenic disturbance (Faber-Langendoen 2018).

Distribution and Range

The native range of *Cypripedium reginae* is restricted to the central and eastern parts of Canada and the United States. It is introduced in Czechoslovakia (POWO 2025). The map in Figure 1 depicts the extent of the orchid in North America.

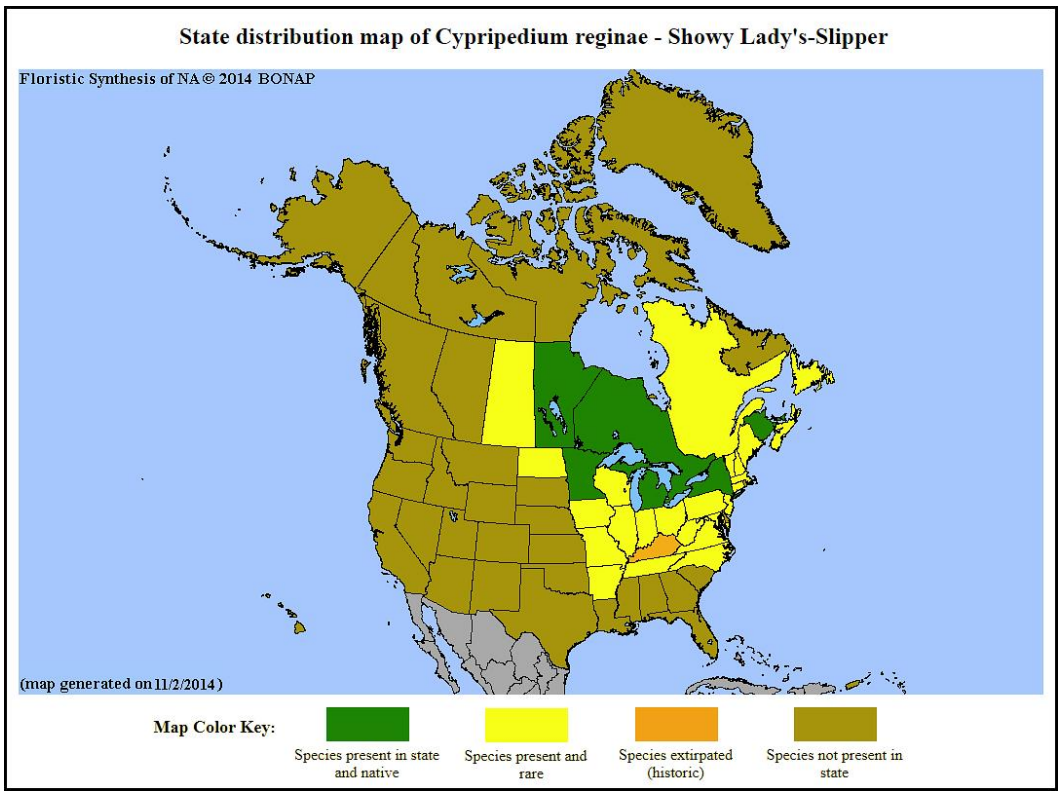


Figure 1. Distribution of C. reginae in North America, adapted from BONAP (Kartesz 2015).

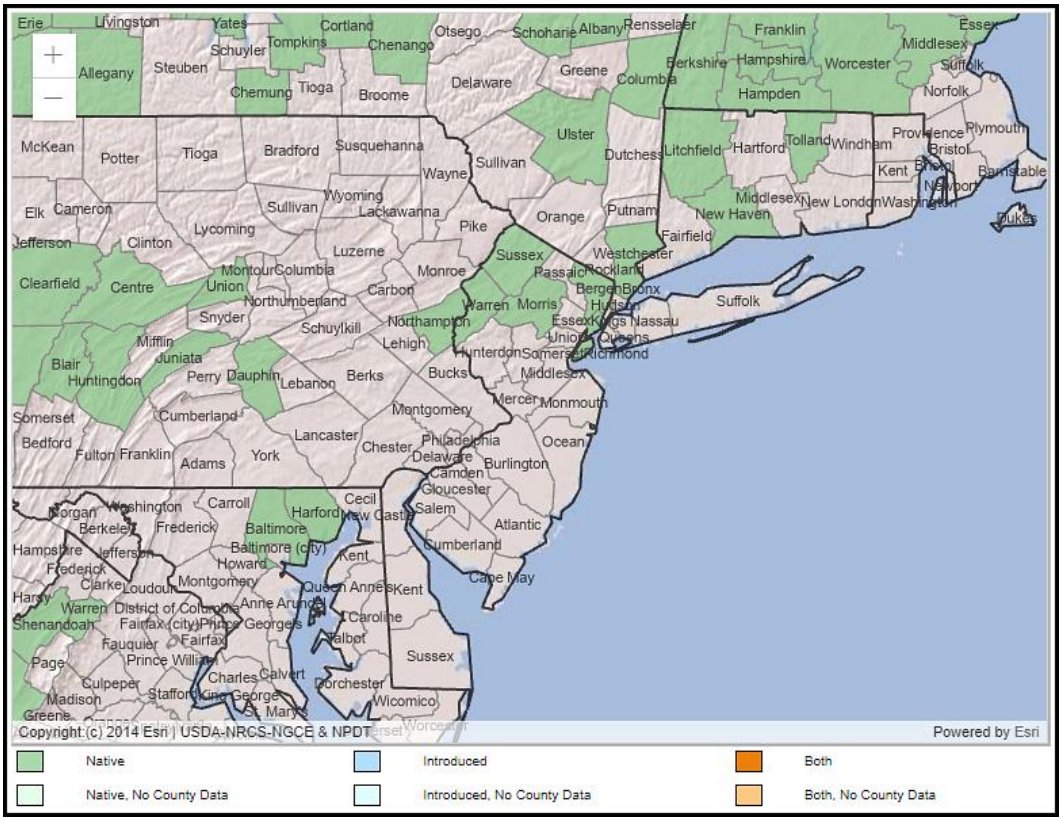


Figure 2. County records of C. reginae in New Jersey and vicinity (USDA NRCS 2025b).

The USDA PLANTS Database (2025b) shows records of *Cypripedium reginae* in five New Jersey counties: Bergen, Hudson, Morris, Sussex, and Warren (Figure 2). It was also reportedly collected in Camden and Ocean counties (Mid-Atlantic Herbaria 2025). The data include historic observations and do not reflect the current distribution of the species.

Conservation Status

Cypripedium reginae has a global rank of G4G5, meaning that there is some uncertainty as to whether it should be considered apparently secure or secure. A G4 species has a fairly low risk of extinction or collapse due to an extensive range and/or many populations or occurrences, although there is some cause for concern as a result of recent local declines, threats, or other factors. A G5 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 2025). The map below (Figure 3) illustrates the conservation status of *C. reginae* throughout its native range. Showy Lady's-slipper is vulnerable (moderate risk of extinction) in three provinces and four states, imperiled (high risk of extinction) in two provinces and five states, critically imperiled (very high risk of extinction) in one province and nine states, possibly extirpated in Maryland, and likely extirpated in Kentucky. In several of the districts where it occurs the orchid is apparently secure or unranked. The native status of *C. reginae* is considered questionable in North Carolina (Weakley et al. 2024, NatureServe 2025). However, Walter's original description of the species is thought to be based on a specimen that was collected in that state during 1787 (Cribb 1997, Ward 2007).

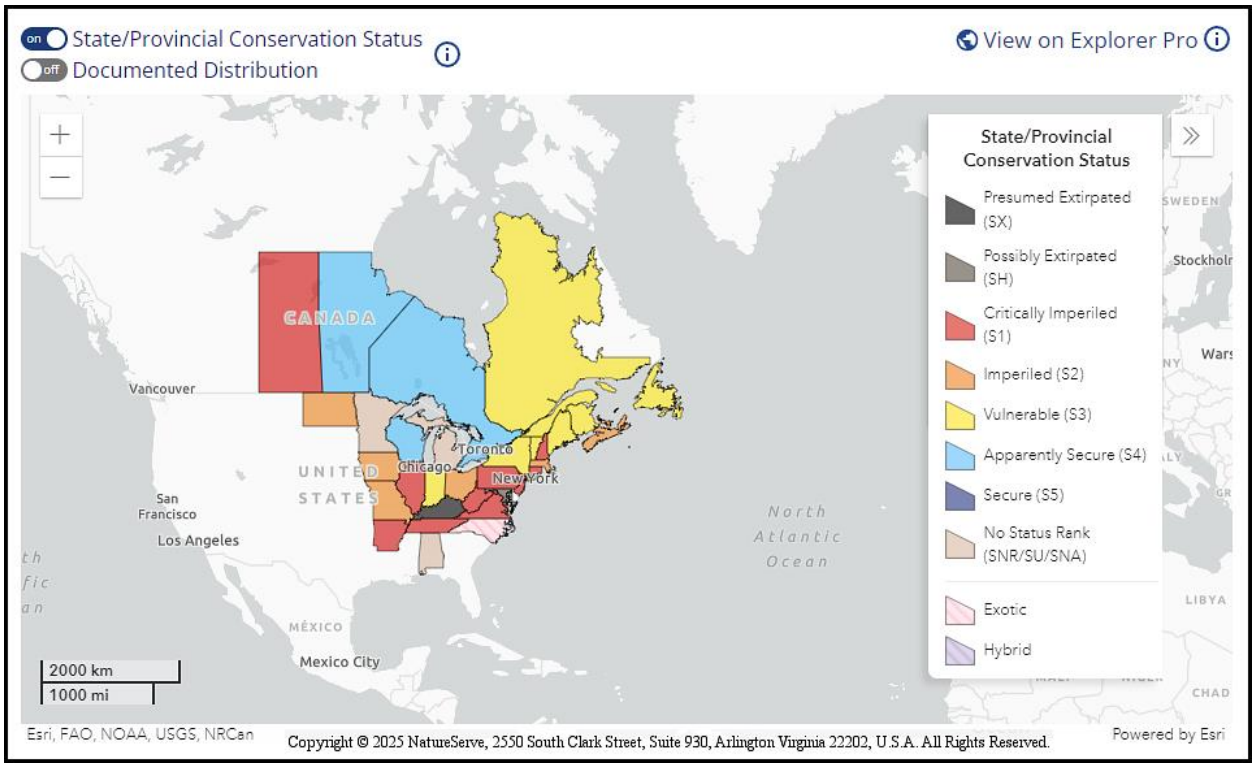


Figure 3. Conservation status of C. reginae in North America (NatureServe 2025).

Cypripedium reginae is critically imperiled (S1) in New Jersey (NJNHP 2024). The rank signifies five or fewer occurrences in the state. A species with an S1 rank is typically either restricted to specialized habitats, geographically limited to a small area of the state, or significantly reduced in number from its previous status. *C. reginae* is also listed as an endangered species (E) in New Jersey, meaning that without intervention it has a high likelihood of extinction in the state. Although the presence of endangered flora may restrict development in certain communities such as wetlands or coastal habitats, being listed does not currently provide broad statewide protection for the plants. Additional regional status codes assigned to the orchid signify that the species is eligible for protection under the jurisdictions of the Highlands Preservation Area (HL) and the New Jersey Pinelands (LP) (NJNHP 2010).

Cypripedium reginae was found in a number of New Jersey counties during the 1800s. Although Willis (1877) vaguely alluded to an occurrence in Monmouth County there do not appear to be any substantiated records from that location. Better documentation exists for populations from Bergen, Hudson, Morris, and Sussex counties during that period, and several Warren County locations were recorded during the early 1900s (Britton 1889, Taylor 1915, NJNHP 2024). In the mid-1900s there were about a half dozen populations remaining in two northwestern counties and Fables (1956) expressed some optimism about their persistence because they were located in out-of-the-way places that might be overlooked by collectors. Unfortunately, David Fables passed away in 1961 and by the time his notes were published the following year most of the remaining *C. reginae* plants had been removed by a poacher known locally as "J. Vandal Doe". Fairbrothers and Hough (1973) listed *Cypripedium reginae* as endangered, noting that only one known site remained in the state, but the designation did not seem to deter pilfering. Abraitys (1980) succinctly remarked that "*Cypripedium reginae* departs with certain trowel-bearing humans" and Snyder (2000) observed that the orchid's decline in the state was directly attributable to overcollection. The current status of *C. reginae* in New Jersey is unclear. Several of the historic occurrences are ranked as extirpated but there are a number of other sites where the species may or may not still be present (Snyder 2000, NJNHP 2024). Since *C. reginae* plants are capable of remaining dormant for several years, the absence of observations during a single site visit to a small population cannot be construed as evidence of extirpation.

Threats

New Jersey is not the only place where the demise of *Cypripedium reginae* has been linked to collection. While all members of the genus are vulnerable to exploitation, Mirenda (2016) characterized *C. reginae* as the "most coveted" of the bunch. Evidence of the species' decline dates back more than a century: Fitzpatrick and Fitzpatrick (1899) remarked that "like most beautiful objects it is rare and approaching extinction." During the 1800s, vast quantities of *C. reginae* flowers and plants were removed from their natural habitats. Waterman (1949) related an eyewitness account of an incident during which a two-horse wagon filled with washtubs was used to collect the flowers in order to decorate a church for a wedding. Around the same era, vendors would sometimes dig up hundreds of plants from a site and then destroy the remainder of the colony to hinder competition (Siegel 2012). The overenthusiastic collection of botanical specimens also contributed to the orchid's predicament. Niles (1907) suggested that when preparing for an outing a botanist should pack a vasculum that was "long enough to take large

plants, such as the Queen Flowers (*Cypripedium reginae*) and her sister species." Lady's-slipper orchids have a low probability of surviving transplantation (Brackley 1985, PANHP 2019, Owen undated). Unfortunately, neither that fact, nor the threat of getting a rash, nor the passage of protective legislation have completely deterred unscrupulous collectors. Poachers continued to deplete *C. reginae* populations throughout the twentieth century and the activity is still one of the primary threats facing the occurrences that remain (Schweinfurth 1925, Curtis 1943, Niemann 1986, Mehrhoff 1989, Davis 1993, Homoya 1993, MacDougall et al. 1998, Ostlie and Neid 1998, Witsell 2008, Light and MacConaill 2011, Breeden 2018, Baumann et al. 2020, Pace 2020).

Human activities have contributed to the loss or decline of *Cypripedium reginae* populations in a number of additional ways. Throughout its range, the orchid is susceptible to habitat destruction or fragmentation resulting from development or resource extraction, water pollution resulting from mining or road maintenance activities, and the application of herbicides (Davis 1993, MacDougall et al. 1998, Ostlie and Neid 1998, Siegel 2012, Davis 2018, PANHP 2019, Pace 2020). For example, shortly after one *C. reginae* population was discovered in Illinois it was buried beneath a pile of gravel fill from an adjacent mine (Sheviak 2013). Since the orchid requires a stable water regime, habitat drainage can be particularly harmful (Curtis 1943, Siegel 2012). Some documented population losses have also been caused by flooding, although in those cases beavers rather than humans were responsible (Nylander 1938, Snyder 2000).

White-tailed Deer (*Odocoileus virginianus*) pose a serious threat to *Cypripedium reginae* throughout much of its range. As with other members of the Orchidaceae, the Showy Lady's-slipper is highly favored by deer and their overabundance is contributing to the rare plant's decline (Alverson et al. 1988, Miller et al. 1992, Judziewicz 2001, Rawinski 2010, Pace 2020). In a population studied by Hornbeck (2005) 56% of the flowering *C. reginae* plants were damaged by deer, and in one small New Jersey colony all of the flowers were nipped off by before they had a chance to set fruit (NJNHP 2024). Gregg (2004) investigated the potential for *C. reginae* populations to recover from single episodes of herbivory. A colony that was moderately browsed (9–46% of stems) regained its pre-herbivory production level after only two years. However, in a colony that experienced more intensive grazing (65–95% of stems) the population size was permanently reduced by more than 70% and it took 11–12 years for the remaining plants to reach their pre-herbivory size and degree of flowering.

Cypripedium reginae may experience reproductive losses in additional ways. In a population studied by Edens-Meier et al. (2010) 75% of the seed capsules were destroyed by unspecified fruit predators, and in another population damage to 25% of the fruits was attributed to moth larvae (Light 2005). Two other moths, *Paralobesia cypripediana* and *P. marilynae*, may also hamper seed development but those species usually feed on ovary tissue rather than mature capsules (Royals et al. 2018). *Cypripedium reginae* is also a larval host plant for *Parallelomma vittatum*, a leaf-mining fly. Although *P. vittatum* does not generally appear to pose a serious threat to the orchid the larvae could cause disproportionate damage to young plants or small colonies (Light and MacConaill 2011, Eiseman 2020).

Disease may also take a toll on some populations of *Cypripedium reginae*. The orchid is susceptible to a rust fungus, *Puccinia cypripedii* (Tiffany and Knaphus 1984). Fungal diseases

can reduce reproduction or increase mortality, particularly when infections are intense or plant vigor has been depleted by other factors (Kranz 1990). Avasthi et al. (2023) noted that *Puccinia* is an especially destructive genus and many of the rusts can bring about severe losses in the host plants. Sadovsky (1962) observed that *P. cypripedii* infections in another *Cypripedium* species had caused the stems of the plants to crack and break off. A newly identified threat is Tobacco Rattle Virus (TRV), a widespread pathogen that was recently documented on *C. reginae* plants in Minnesota. TRV can damage the vegetative and reproductive organs of host plants (Otulak et al. 2016). Severe leaf necrosis was observed in the infected orchids (Baumann et al. 2020).

Climate Change Vulnerability

An assessment of the potential effects of climate change on selected plants determined that *Cypripedium reginae* was moderately vulnerable in New Jersey (Ring et al. 2013). Similar assessments in other parts of the country have concluded that the orchid's vulnerability was high in Maine (Whitman et al. 2013) and very high in Illinois (Molano-Flores et al. 2019). Some of the risk factors for *C. reginae* may be offset by its adaptive capacity, making it difficult to project how the orchid will be affected by changing climactic conditions.

Temperatures are rising at an unprecedented rate in New Jersey, with the increase being especially pronounced during the winter months, and changes in global circulation patterns are also resulting in atypical weather patterns and prolonged periods of drought (Hill et al. 2020). Local weather conditions influence many aspects of the life cycle of *Cypripedium reginae*. During the establishment phase young plants require multiple periods of exposure to low temperatures and desiccation may be particularly injurious to seedlings (Curtis 1943, Waterman 1949). In older plants climactic cues govern bud initiation, stem elongation, floral development, and the ripening of fruit (Waterman 1949, Curtis 1954, Brackley 1985). During 2020, *Cypripedium acaule* plants in northern New Jersey emerged and produced buds early in response to a brief spell of unseasonably warm weather but the stems were subsequently killed by frost (personal observation). When *C. reginae* experiences periods of drought its pollinated flowers are less likely to develop fruit (Bernhardt and Edens-Meier 2010) and the plants may senesce early (Harvais 1980). A positive correlation was found between spring rains the and survival of *C. reginae* plants, underscoring the importance of predictable seasonal cycles (Kéry and Gregg 2004, Kaye et al. 2019). *Cypripedium reginae* might be able to compensate for some erratic weather patterns and other environmental stress factors by remaining dormant (Light 2005, Shefferson et al. 2007), particularly since established plants are capable of persisting underground for several years in a row. However successful dormancy in *Cypripedium* species requires consistently low winter temperatures and if that regime is disrupted it can be fatal to the plants (Zeng et al. 2014).

Management Summary and Recommendations

Recent searches of a New Jersey site where *Cypripedium reginae* was last seen in 1998 have failed to turn up any plants but, as previously discussed, it is possible that the orchids were dormant. If the species is still present some judicious thinning of the canopy might stimulate its

growth (NJNHP 2024). The use of prescribed burns as a management tool is not recommended because it could have a detrimental impact on the target species. Curtis (1943) cited fire as one example of a way in which the orchid's clumped distribution makes it more vulnerable to destruction, and at a site that had historically been maintained by annual burns the *C. reginae* appeared only after the use of fire was discontinued (Ruch et al. 2013). Any extant populations of *C. reginae* in New Jersey should be protected from deer browse to the greatest extent possible, although the use of fencing is often precluded by site characteristics in the places where the species grows (Rawinski 2010).

The top global management priorities for *Cypripedium reginae* are the maintenance of stable hydrology in extant habitats and the prevention of poaching (Ostlie and Neid 1998). In theory, wild populations of *C. reginae* will benefit when plants that are grown in vitro become readily available to orchid enthusiasts. Propagation studies over the past 50 years (see Heinrich et al. 1981, Oliva and Arditti 1984, Light 1989, DePauw and Remphrey 1993, Sokolski et al. 1997, Burch and Chambers 2011, and numerous others) have progressed from the germination of seedlings on an artificial medium to the production of plants with healthy roots and shoots that can flower normally (Zeng et al. 2014, Owen undated).

Synonyms

The accepted botanical name of the species is *Cypripedium reginae* Walter. Orthographic variants, synonyms, and common names are listed below (ITIS 2025, POWO 2025, USDA NRCS 2025b).

Botanical Synonyms	Common Names
Calceolus reginae (Walter) Nieuwl.	Showy Lady's-slipper
Cypripedium album Aiton	Queen Lady's-slipper
Cypripedium canadense Michx.	Royal Moccasin-flower
Cypripedium hirsutum f. *album* R. Hoffm.	
Cypripedium reginae f. *albolabium* Fernald & B. G. Schub.	
Cypripedium reginae var. *album* (Aiton) Rolfe	
Cypripedium reginae f. *album* (Aiton) House	
Cypripedium spectabile Salisb.	
Cypripedium spectabile var. *album* Sweet	
Cypripedium spectabile var. *incarnatum* Sweet	

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