

Platanthera flava var. *flava*

Southern Rein Orchid

Orchidaceae



Platanthera flava var. *flava* courtesy Alan Cressler, Lady Bird Johnson Wildflower Center

***Platanthera flava* var. *flava* Rare Plant Profile**

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

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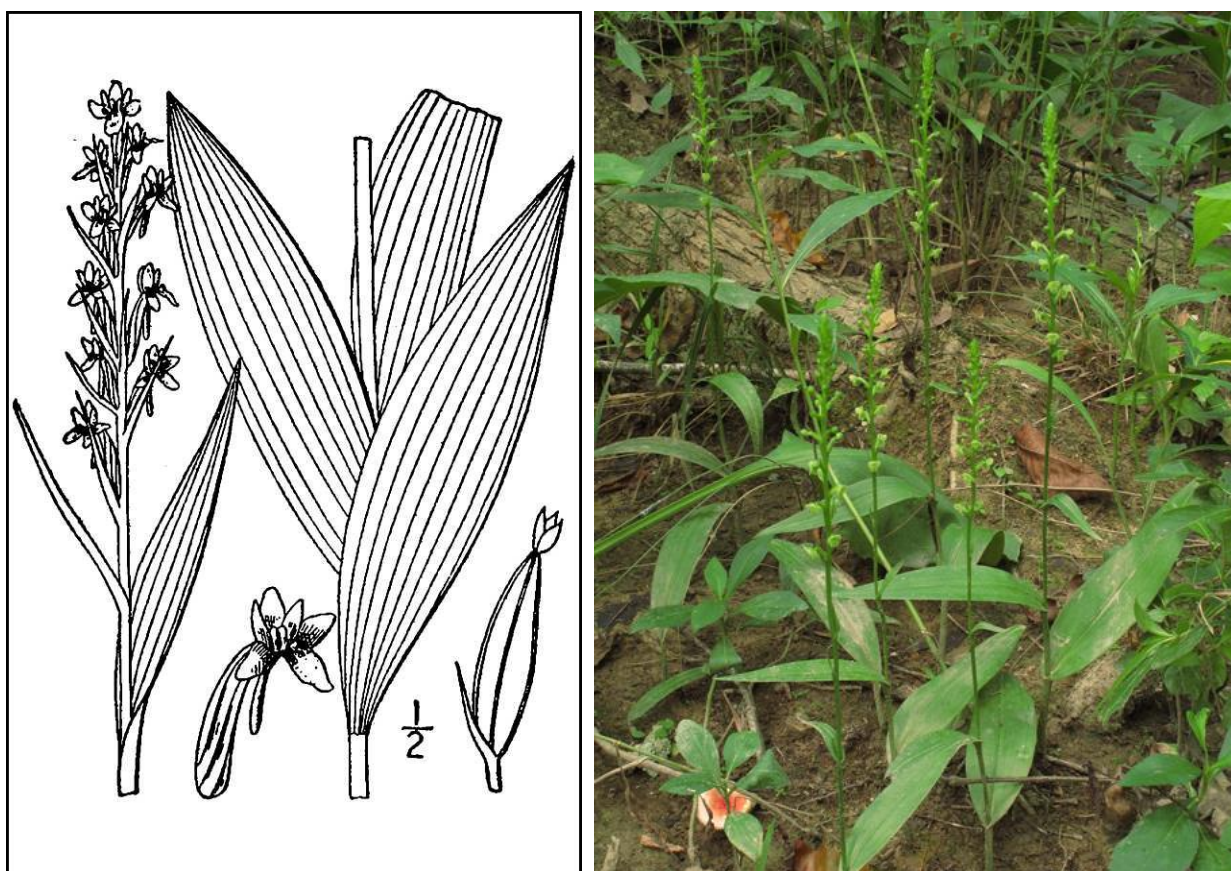
May, 2023

For:
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This report should be cited as follows: Dodds, Jill S. 2023. *Platanthera flava* var. *flava* Rare Plant Profile. New Jersey Department of Environmental Protection, State Parks, Forests & Historic Sites, State Forest Fire Service & Forestry, Office of Natural Lands Management, New Jersey Natural Heritage Program, Trenton, NJ. 17 pp.

Life History

Platanthera flava var. *flava* (Southern Rein Orchid) is a perennial orchid that grows from fleshy, tuberoid roots. The stems may be up to 7 dm in height and usually bear 2–3 leaves. The leaves are smooth-edged and narrowly lance-shaped, measuring 5–35 cm in length and 1–5 cm in width. The inflorescence of *P. flava* var. *flava* is a spike of yellow-green flowers subtended by leaflike bracts that are mostly shorter than the flowers. The three sepals are ovate-oblong, with the upper one held erect and the other two spreading, while the lateral petals are ovate and somewhat scalloped on the edges. The broad lower petal (lip) is lobed at the base and has a large protrusion (tubercle) in the center; and the rear extends downward in a slender spur 4–9 mm long that is rather club-shaped at the tip. Pollen packets (pollinia) are paired in *Platanthera*. (See Britton and Brown 1913, Ames and Correll 1943, Fernald 1950, Godfrey and Wooten 1981, Gleason and Cronquist 1991, Liggio and Liggio 1999, Fowler 2005, Sheviak 2020).



Left: *P. flava*, Britton and Brown 1913, courtesy USDA NRCS 2023a. Right: *P. flava* var. *flava*, courtesy Alan Cressler, Lady Bird Johnson Wildflower Center.

Platanthera flava var. *flava* sometimes occurs as scattered individual plants but at other times it can form extensive colonies. The orchid propagates clonally, forming new ramets from its underground stems. Vegetative offshoots are usually separated by distances of 5–15 cm (Magrath 2001). In favorable habitats hundreds of plants may be present (Liggio and Liggio 1999), and over a thousand were observed at one Oklahoma site (Magrath 2001). Not all of the plants in a typical population bloom each year: For example, in one growing season only 7 out of

50 *P. flava* var. *flava* plants at an Indiana site flowered (Homoya 1982). Throughout its range, Southern Rein Orchid may bloom from March through October (Sheviak 2020, Weakley et al. 2022). In New Jersey *P. flava* has been known to flower from early June through late July but primarily in July, while fruit development extends into August and September (Stone 1911, Hough 1983). Fowler (2005) noted that the blooming period of *P. flava* var. *flava* is long in comparison to many other orchids, and that the flowers often persist even after the fruits have begun to develop.

Two varieties of *Platanthera flava* are widely recognized: var. *flava* and var. *herbiola*. Generally speaking *P. flava* var. *flava* has a more southern range while the distribution of var. *herbiola* is more northern but the ranges of the two varieties overlap in many states, including New Jersey. *P. flava* var. *herbiola* differs from var. *flava* in several ways: Its lip petals are narrower, its inflorescences are stouter, and its floral bracts are usually longer than the flowers. When true to type the varieties are distinct but in areas where their ranges overlap transitional forms exist (Sheviak 2020, NAOCC 2023). Both varieties of *Platanthera flava* are present, albeit rare, in New Jersey and herbarium specimens from at least one location have intermediate characteristics (Snyder 1986). Several experts have questioned the distinctiveness of the two varieties (Ogle et al. 1994) and some organizations are moving to consolidate them, recognizing *P. flava* only at the species level (eg. ILESPB 2013). Throughout this profile, use of either the specific or the varietal epithet depends upon the taxon level utilized by the cited source.

Pollinator Dynamics

In *Platanthera* flowers, each of the pollinia is attached to a flexible stalk (caudicle) that has a sticky disc on the other end. The paired pollinia are situated perfectly to come into contact with insects as they access the nectar at the bottom of the spurs. The outward-facing discs adhere to the visitor as it leaves and then drying of the caudicles causes them to rotate downward and inward, positioning them to deposit the pollen clusters on the next flower visited (Gray 1879, Brackley 1985). Self-fertilization may be inhibited by the amount of time required for the stalks to bend (Catling and Catling 1991).

Platanthera flava is pollinated by mosquitoes in the genus *Aedes* and small pyralid moths such as the Yellow-spotted Webworm, *Anageshna primordialis* (Argue 2012, Hilty 2020, Pace 2020, NAOCC 2023). Potential pollinators visit the flowers in search of nectar—Neiland and Wilcock (1998) found that orchids which produce nectar generally have a higher rate of fruit set than nectarless species. The insects may also be attracted by scent: Brackley (1985) described the blooms of *P. flava* var. *herbiola* as lightly fragrant. Hapeman (1996) indicated that he had found several different species of pyralid moth pollinating *P. flava* var. *herbiola* plants in south-central Wisconsin. Although mosquitoes may be less capable of carrying and transferring pollen than some other insects, their large numbers could help to compensate for their reduced effectiveness as individual pollinators (Peach and Gries 2020).

The tubercle on the lip of *Platanthera flava* forces nectar-seeking insects to the side of the flower so only one pollinium per visitor is removed (Catling and Catling 1991). *Platanthera obtusata*, which similarly has a lip appendage that compels insects to enter the nectary from one side, is

also pollinated by *Aedes* spp. and *Anageshna primordialis* (Stoutamire 1968, Voss and Reifner 1983). Mosquitoes that have been documented on *P. obtusata* include *Aedes communis* and *A. canadensis* (Thien 1969). Stoutamire (1968) noted that only female mosquitoes were seen carrying pollen. In *P. obtusata* the pollinia adhere to the eyes of both the mosquitoes and the moths (Stoutamire 1968, Voss and Reifner 1983).



Aedes canadensis by Tom Murray, 2021.



Anageshna primordialis by J. S. Dodds, 2020.

Seed Dispersal and Establishment

The fruits of *Platanthera flava* var. *flava* are elliptical capsules 5–9 mm long. Fruit set in the species has been described as "relatively high", with capsules developing in 30–70% of the flowers (Magrath 2001). The seeds of orchids lack endosperm and consist mainly of an embryo surrounded by a loose, papery coating (Dressler 1981). Individual orchid plants produce numerous tiny propagules that are often referred to as dust seeds: Millions per plant have been reported for some species (Romero-González et al. 2020). Wind is the primary means of dispersal for the minute seeds, shaking them out of the capsules and then carrying them to new locations (Stoutamire 1964, Dressler 1981). Orchid seeds have relatively large internal air spaces that permit them to float in the air for long periods. Average measures of 0.64 mm in length, 81% internal air space, and 6.7 seconds of flotation time in air have been reported for the genus *Platanthera*. Many orchid seeds also have a water-resistant outer surface that—together with the internal air space—permits flotation, allowing some movement of seeds via surface water after a rain. Numerous species of *Platanthera* have seeds that are able to float. The general characteristics of orchid seeds also allow their transport by adherence to land animals and birds (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. When the seeds become hydrated limited metabolic activity is initiated but establishment requires appropriate physical conditions and, in nature, the right kind of fungi (Dressler 1981, Arditti and Ghani 2000). Germination in *Platanthera* species is usually inhibited by light (Rasmussen 1995). When an orchid seed germinates the embryo swells into a mass of cells called a protocorm, and the lower portions initiate root hairs while the cells on the upper surface may eventually develop into a leafy shoot. Prior to leaf development, the seedlings are

completely dependent on their fungal associate for nutrients (Dressler 1981). A relatively high proportion of orchid seeds initiate germination but fail to develop further (Rasmussen and Whigham 1993, Jersáková and Malinová 2007). Sharma et al. (2003) indicated that only 0–3% of *Platanthera* seeds are likely to reach the leaf-bearing seedling stage.

Platanthera seeds may occasionally germinate in the absence of fungi, producing long epidermal hairs that could become sites for fungal contact, but formation of protocorms does not occur without symbionts (Zelmer et al. 1996). Stoutamire (1964) attempted to study the development of *Platanthera flava* but the seeds failed to germinate. Heinrich et al. (1981) successfully grew *P. flava* var. *herbiola* in a laboratory although the germination rate was low (1%). Germination occurred 88 days after sowing, and the developmental sequence observed over a six-month period was protocorm, rhizoids, rhizome, and shoot.

It is not clear whether *Platanthera flava* requires a specific fungal associate in order to develop. Zelmer et al. (1996) found evidence that *Platanthera* species can form relationships with more than one fungus simultaneously, noting that seedlings might associate with different fungi than mature plants and that fungal partners may be selected based upon availability. Some orchids may have a narrower host range during their establishment phase than at maturity (Rasmussen and Rasmussen 2009).

Habitat

Dressler (1981) cited *Platanthera flava* as an exception to the rule that "orchids don't like wet feet." *P. flava* var. *flava* is found at relatively low elevations (0–300 meters above sea level) and almost exclusively grows in wet places such as swamps, floodplains, mucky streamsides, and wet soil of thickets, meadows, or swales (Ames and Correll 1943, Godfrey and Wooten 1981, Magrath 2001, Munden 2001, Sheviak 2020, Weakley et al. 2022). Liggio and Liggio (1999) observed that Southern Rein Orchid often grows in standing water or sites that flood during the spring, and the species is also known from ephemeral pools or other sites that become ponded in winter (Homoya 1993). Reported substrates include mud, muck, rotting logs, sphagnum, gravel, and cobble (Ames and Correll 1943, Godfrey and Wooten 1981, Magrath 2001, Munden 2001, Morris 2013).

Many of the sites where *Platanthera flava* var. *flava* has been found are densely forested and heavily shaded (Liggio and Liggio 1999, Morris 2013, Weakley et al. 2022). Magrath (2001) characterized it as "strictly a shade plant," although Ames and Correll (1943) described its habitat as "open woods." Fowler (2005) observed that *P. flava* var. *flava* plants in sunny spots had yellow-green leaves and denser floral spikes while those growing in deeper shade had dark green leaves and more space between the flowers.

In the forested wetlands supporting populations of *Platanthera flava* var. *flava* the canopy can be composed of deciduous trees, evergreen species, or a mixture of both (Magrath 2001, Sheviak 2020). In Illinois swamps and floodplain forests some characteristic canopy trees include *Liquidambar styraciflua* and oaks such as *Quercus palustris*, *Q. michauxii*, or *Q. bicolor* (Homoya 1982, 2006; Homoya et al. 1985). Mississippi plants often grow at the bases of large

Taxodium distichum trees (Morris 2013) and one type of Louisiana habitat was described as moist pinelands (Pridgeon and Urbatsch 1977). In Tennessee, *P. flava* var. *flava* was noted as one of the dominant herbs beneath a canopy of *Acer rubrum*, *Fraxinus pennsylvanica*, and *Quercus michauxii* (Mukherjee et al. 2012).

New Jersey's extant population occurs in a *Acer rubrum*—*Nyssa sylvatica*—*Liquidambar styraciflua*—*Populus heterophylla* forest, also known as Cape May Lowland Swamp. The community type is critically imperiled both globally (G1) and in the state (S1). The unique habitat has historically supported a number of other rare species in addition to *Platanthera flava* var. *flava* (Breden et al. 2001, Westervelt et al. 2006). At the other end of the habitat spectrum, *P. flava* var. *flava* was recently documented at the location of a former copper mine in Tennessee. The site was once so degraded that it was nicknamed the Bare Zone, but intense revegetation efforts have resulted in the gradual development of distinct communities comparable to those of the surrounding area and the subsequent establishment of the rare orchid (Shelton 2020).

Wetland Indicator Status

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

USDA Plants Code (USDA, NRCS 2023b)

PLFLF

Coefficient of Conservatism (Walz et al. 2018)

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 *Platanthera flava* var. *flava* is restricted to the United States and Canada (POWO 2023). The map in Figure 1 depicts the extent of Southern Rein Orchid in the United States. It has also been reported in Nova Scotia and Ontario (Sheviak 2020).

The USDA PLANTS Database (2023b) shows records of *Platanthera flava* var. *flava* in 16 New Jersey counties: Bergen, Camden, Cape May, Essex, Hudson, Mercer, Middlesex, Monmouth, Morris, Ocean, Passaic, Salem, Somerset, Sussex, Union, and Warren (Figure 2). The data include historic observations and do not reflect the current distribution of the species.

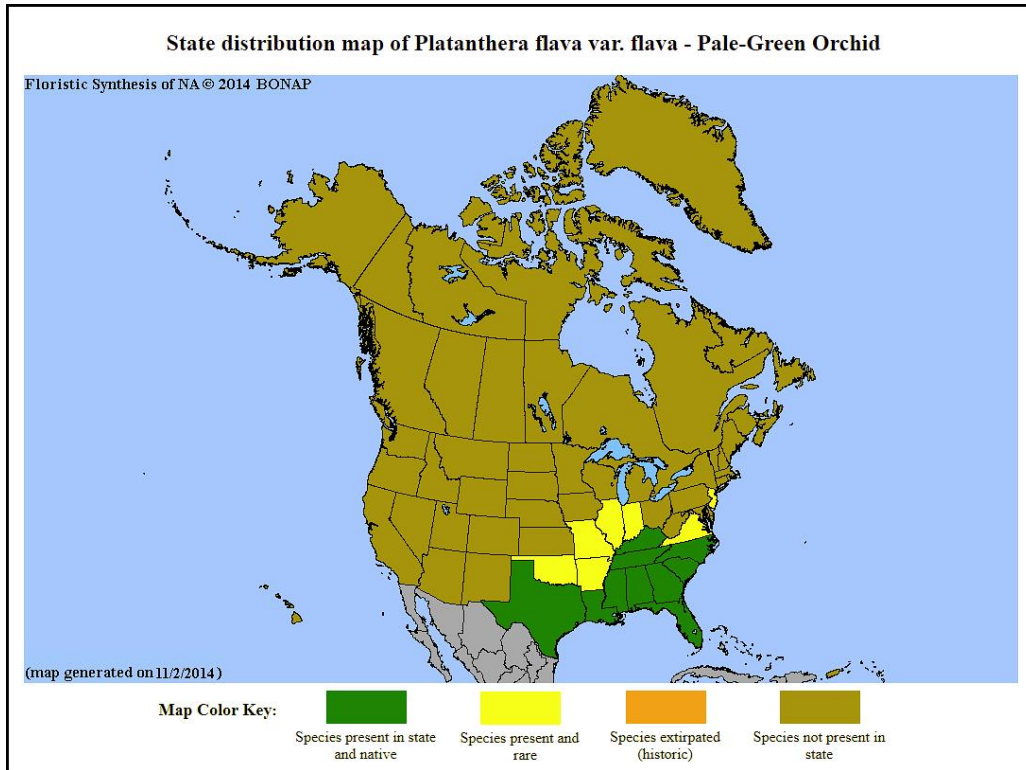


Figure 1. Distribution of *P. flava* var. *flava* in the United States, adapted from BONAP (Kartesz 2015).

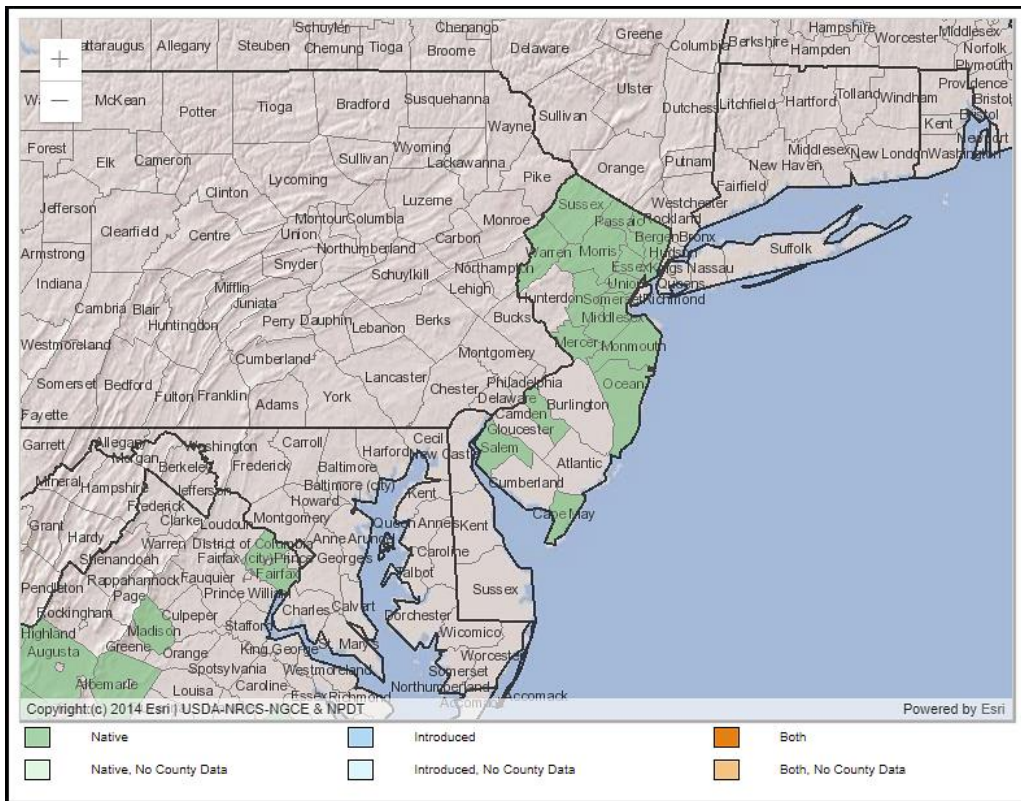


Figure 2. County records of *P. flava* var. *flava* in New Jersey and vicinity (USDA NRCS 2023b).

Conservation Status

Platanthera flava var. *flava* is apparently secure at a global scale. The G4?T4?Q rank means the variety is at 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. The question marks (? and Q) indicate that the taxon is in need of review and also that the taxonomic status of the variety is uncertain (NatureServe 2023). The map below (Figure 3) illustrates the conservation status of *P. flava* var. *flava* throughout its range. The orchid is critically imperiled (very high risk of extinction) in four states, imperiled (high risk of extinction) in five states and one province, and vulnerable (moderate risk of extinction) in three states. *P. flava* var. *flava* is apparently secure in Mississippi and has not been ranked in other states where it occurs.

In North America, *Platanthera flava* var. *flava* has also been identified as a plant species of highest conservation priority for the North Atlantic region, which includes four Canadian provinces and twelve U. S. states. The species has a regional rank of R3 (vulnerable), signifying a moderate risk of extinction (Frances 2017). *Platanthera flava* is not presently listed at the federal level as an earlier review found no identifiable threat (USFWS 1980, 2023).

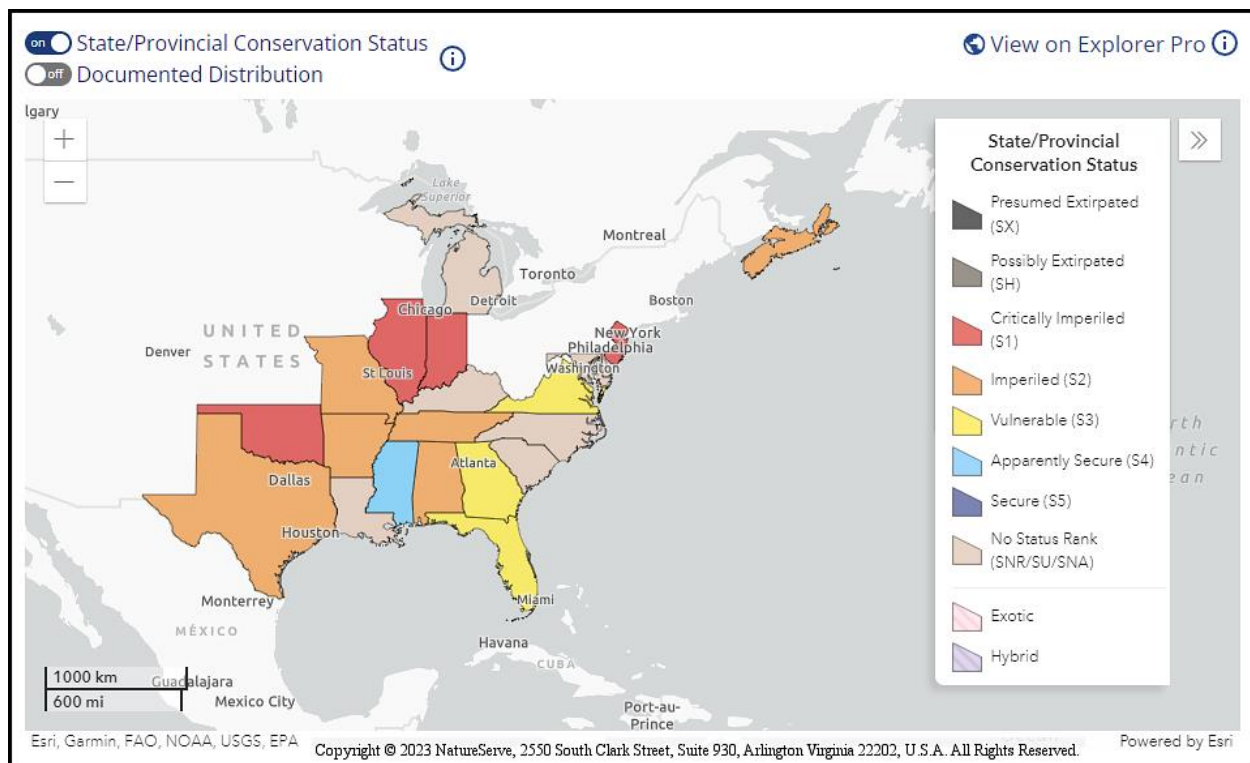


Figure 3. Conservation status of *P. flava* var. *flava* in North America (NatureServe 2023).

New Jersey is one of the states where *Platanthera flava* var. *flava* is critically imperiled. The S1 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. *P. flava* var. *flava* 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).

Early New Jersey records of *Platanthera flava* did not make a distinction between varieties but sources consistently reported that the species was frequent in the northern part of the state (Britton 1889, Stone 1911, Taylor 1915). The USDA NRCS (2023b) shows *P. flava* var. *herbiola* in just 3 of the 16 counties which were mapped for the state distribution of *P. flava* var. *flava* (see Figure 2). Only four occurrences of *P. flava* var. *flava*—none of which are located in northern New Jersey—are tracked in the Natural Heritage Database and one of those is extirpated while two others are historical (NJNHP 2022). The sole extant occurrence, a large population situated at the southern end of the state, was discovered in 1985 (Snyder 1986).

Threats

No specific threats to New Jersey's population of *Platanthera flava* var. *flava* have been identified. When last observed the occurrence was extensive and the habitat was characterized as pristine (NJNHP 2022). Nevertheless, there are a number of potential threats that could develop into more pressing concerns.

Throughout its range, the primary threat to *P. flava* var. *flava* is habitat loss. Historically the losses resulted from the conversion of floodplain forests to agricultural fields, and although the wetlands now enjoy better protection they are still often subject to significant changes in hydrology as adjacent land becomes developed (Ogle et al. 1994). Alteration of wetland habitats can also facilitate the establishment of invasive plant species. No studies of the impact of competition on *P. flava* were found, but the proliferation of any non-native plant that can become overabundant in forested wetlands is likely to reduce the number of suitable germination microsites for the orchid.

Although *Platanthera flava* is reliant on a narrow range of insects for fertilization its pollinators are generally present in large numbers. However pollinator availability could be significantly diminished by pest eradication programs. In New Jersey, both biological and chemical agents are utilized for mosquito control (Cape May County 2023), and the application of pesticides could also reduce local moth populations.

Limited information is available regarding the impacts of White-tailed Deer (*Odocoileus virginianus*) on *Platanthera flava*. Miller et al. (1992) noted that plants in the Liliaceae and Orchidaceae are disproportionately favored by the herbivores and listed *P. flava* as a species known to be damaged. Knapp and Weigand (2014) found that *P. flava* var. *herbiola* populations did not decline significantly when large herds of deer were present. Deer often selectively browse on the buds or flowers of woodland herbs, which might permit the clonally-maintained *P. flava* var. *flava* to persist in places where it is already established but limit sexual reproduction and opportunities for colonization of new sites.

As the global climate becomes warmer, some of the effects in New Jersey include higher temperatures, shifting precipitation patterns that increase the frequency and intensity of both droughts and floods, and rising sea levels in coastal areas (Hill et al. 2020). A climate impact assessment in Illinois, another state where *Platanthera flava* var. *flava* is critically imperiled, concluded that the orchid is extremely vulnerable to climate change (Molano-Flores et al. 2019). Southern Rein Orchid is also highly vulnerable in New Jersey because the sole population is located in a low-lying area near the coast. The aquifer in the vicinity of the occurrence is known to be susceptible to contamination from saltwater intrusion (Lacombe and Carleton 2002), and the site could occasionally be subject to tidal surge flooding following extreme storms such as 2012's Superstorm Sandy (NJ Adapt 2023). Rising seas may eventually render the site unsuitable for the orchid.

Management Summary and Recommendations

About 25 years have passed since New Jersey's population of *Platanthera flava* var. *flava* was last monitored. Although the viability of the occurrence appeared excellent at the time, an updated site visit is needed to reassess the population's status and identify current threats.

Nearly 30 years ago Ogle et al. (1994) identified a number of topics on which research was needed for *P. flava* var. *flava* including germination and seedling growth requirements, favorable soil chemistry and light levels, and the relative contributions of sexual and asexual reproduction to population maintenance. The subjects remain unstudied, and there are additional areas where research could contribute to conservation planning for the species such as identification of specific fungal associates at different life stages and evaluation of the impacts of competition, herbivory, or salinity on plant vigor and survival. Genetic studies might also help to determine whether a reliance on clonal growth is limiting diversity, and to clarify the relationship between *P. flava* var. *flava* and *P. flava* var. *herbiola*.

Synonyms

The accepted botanical name of the species is *Platanthera flava* var. *flava* (L.) Lindl. Orthographic variants, synonyms, and common names are listed below (ITIS 2023, POWO 2023, USDA NRCS 2023b).

Botanical Synonyms

Habenaria flava (L.) R. Br.
Habenaria flava f. *lutea* Louis-Marie ex B. Boivin
Habenaria scutellata (Nutt.) F. Morris
Orchis bidentata Elliott
Orchis scutellata Nutt.
Perularia bidentata (Elliott) Small
Perularia flava (L.) Farw.
Perularia scutellata (Nutt.) Small

Common Names

Southern Rein Orchid
Pale-green Orchid
Tubercled Orchid

Platanthera flava f. *lutea* (Louis-Marie ex B. Boivin) R. E. Whiting & Catling

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