Platanthera integra

Yellow Fringeless Orchid

Orchidaceae

Platanthera integra by J. S. Dodds, 2015

***Platanthera integra* 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

501 E. State St.
PO Box 420
Trenton, NJ 08625-0420

Prepared by:
Jill S. Dodds
jsdodds@biostarassociates.com

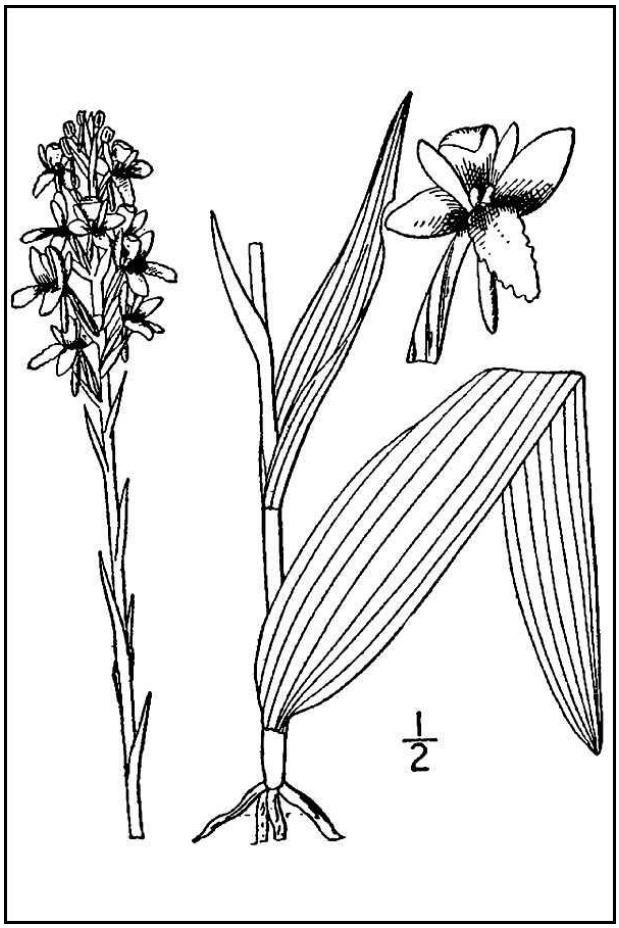
May, 2024

For:
New Jersey Department of Environmental Protection
Office of Natural Lands Management
New Jersey Natural Heritage Program
natlands@dep.nj.gov

This report should be cited as follows: Dodds, Jill S. 2024. *Platanthera integra* 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, Trenton, NJ. 20 pp.

Life History

Platanthera integra (Yellow Fringeless Orchid) is a perennial herb that has both slender and tuberous roots. The stems are 20–75 cm high and the leaves—which are arranged alternately on the stem—are narrowly lance-shaped, clasping, and entire. The lowest leaf may be up to 32 cm long but the 1–2 leaves above it are considerably smaller and those on the uppermost part of the stem are bract-like. The inflorescence is a dense spike of brightly colored flowers which may be yellow or orange-yellow. When a *P. integra* plant first begin to bloom the inflorescence is conic but it becomes more cylindrical as additional flowers open (Liggio and Liggio 1999). It is easy to distinguish Yellow Fringeless Orchid from other members of the genus when the plants are in flower—only two other *Platanthera* species that occur in New Jersey have yellow-orange flowers and both have deeply fringed lips, whereas the lip of a *P. integra* flower is oval and wavy-margined but not fringed. Each flower has slender, tapering spur that is 5–10 mm long. The fruit is a many-seeded capsule. (See Gray 1840, Britton and Brown 1913, Fernald 1950, Hawkes 1950, Gleason and Cronquist 1991, Morris 2013, Sheviak 2020, NAOCC 2024).



Left: Britton and Brown 1913, courtesy USDA NRCS 2024a. Right: J. S. Dodds, 2015.

Throughout its range, *Platanthera integra* may flower from July through early September and fruits develop soon after (Massey 1953, Hough 1983, Sheviak 2020, Weakley et al. 2024). Flowering rates within any *Platanthera* population are likely to vary from one year to the next (POWO 2024) and that seems to be the case for *P. integra* (Holmes 1983, NJNHP 2024).

Gray (1840) remarked that *Platanthera integra* appeared to be closely allied to *P. cristata* but Rydberg established a separate genus (*Gymnadeniopsis*) which only included *P. integra, P. clavellata,* and *P. nivea* (Britton 1901). The flowers of those three orchids have stigmatic appendages that are not found in any other *Platanthera* species. An analysis of nuclear ribosomal DNA indicated that *Gymnadeniopsis* was a paraphyletic taxon and that *P. blephariglottis, P. ciliaris, P. cristata,* and *P. integrilabia* belonged to the same lineage (Hapeman and Inoue 1997). Nevertheless, the morphological difference is compelling and some botanists continue to view the former *Gymnadeniopsis* trio as a distinct subgroup within *Platanthera* (eg. Efimov 2011, Sheviak 2020).

Pollinator Dynamics

The majority of *Platanthera* species are fertilized by insects, typically moths or butterflies, but a broad range of pollination syndromes can be found in the genus and they are primarily determined by floral structure (Dressler 1981, Hapeman and Inoue 1997). A few species, including *P. integra,* are pollinated by bumblebees. The pollinaria of *P. integra* are close together, parallel, and perfectly situated so that the sticky viscidia will come into contact with the proboscis of a foraging bee (Argue 2012). A detailed illustration of a *P. integra* gynostemium (the column formed by fusion of the male and female reproductive parts) was provided by Efimov (2011).

The American Bumblebee, *Bombus pensylvanicus,* has been identified as a key pollinator of Yellow Fringeless Orchid (Argue 2012, NAOCC 2024). Unfortunately, *B. pensylvanicus* has experienced dramatic range-wide population declines in recent years (Cameron et al. 2011, Gamillo 2021) and the insect is presently under review for listing at the federal level (USFWS 2024a). It is possible that *Platanthera integra* can utilize more than one type of pollinator. Hapeman and Inoue (1997) noted that most of the bee-pollinated *Platanthera* species could also be fertilized by moths or butterflies, and Fowler (2005) indicated that the flowers of *P. integra* were butterfly-pollinated.

Morong (1893) suggested a potential mechanism for self-fertilization in *Platanthera integra* based on observations of the flower structure. Although quite a few other members of the genus are capable of self-pollination (Hapeman and Inoue 1997) there does not appear to be any documentation of effective self-fertilization in *P. integra*. However, no studies ruling out the possibility were found either.

Seed Dispersal and Establishment

The capsules of *Platanthera integra* are cylindrical or ellipsoid and can be up to 10 mm long and 3 mm wide. They typically point upward or outward at maturity (Sheviak 2020, NAOCC 2024). Zettler et al. (2000) described *P. integra* capsules as "yellowing" in mid-October. Most orchids produce numerous tiny propagules known as dust seeds which lack endosperm and consist mainly of an embryo surrounded by a loose, papery coating (Dressler 1981). Brown (1909) described and illustrated embryonic development in *Platanthera integra*. An estimate of

reproductive capacity cited for another member of the genus, *P. chlorantha*, was 25,000 seeds per capsule (Arditti and Ghani 2000).

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*. Limited dispersal of seeds may also occur by other means. For example, 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. The seeds of *P. integra* apparently have the ability to float on water, although the duration was not reported (Arditti and Ghani 2000). Arditti and Ghani also noted that the general characteristics of orchid seeds suggest the possibility of transport by adherence to land animals or birds.

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).

Poff et al. (2016) found that germination of *Platanthera chapmanii* was improved when the seeds were exposed to a period of cold stratification and suggested that *P. integra* might also benefit from the treatment. A relatively high proportion of orchid seeds germinate but fail to develop further (Rasmussen and Whigham 1993, Jersáková and Malinová 2007). *Platanthera* seeds can 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). Sharma et al. (2003) indicated that only 0–3% of *Platanthera* seeds are likely to reach the leaf-bearing seedling stage.

Zettler et al. (2000) studied germination in *Platanthera integra*, collecting fungi from mature plants of that species and other members of the genus (*P. ciliaris*, *P. integrilabia*) to examine symbiotic relationships. All of the fungi were identified as *Epulorhiza* spp. The only *P. integra* seedlings to reach leaf-bearing stage were cultured with a fungus that had been associated with a *P. integrilabia* seedling, while fungi collected from mature orchids (including *P. integra*) were less effective. It had previously been thought that *Platanthera* species could associate with different fungi during the establishment phase and at maturity (Zelmer et al. 1996). Rasmussen and Rasmussen (2009) suggested that orchids were likely to be more host-specific during the seedling stage, although they noted that further study of the subject was required. Like many other orchids, *Platanthera integra* develops slowly—the first leaf-bearing seedlings in the experiment conducted by Zettler et al. (2000) appeared 14 months after the seeds germinated.

Habitat

Platanthera integra has been found at elevations of 0–900 meters above sea level. The orchid favors open sites with acidic sandy or peaty substrate in wet pinelands (Keller and Brown 1905, Calazza and Fairbrothers 1980, Fairbrothers and Hough 1973, Hough 1983, Sheviak 2020, NAOCC 2024). Weakley et al. (2024) characterized *P. integra* as a highly heliophilic species, signifying that it requires an open canopy for successful reproduction and long-term survival.

In New Jersey, *Platanthera integra* has mainly been recorded in Pine Barren savannas, acidic seepage fens located in riverside floodplains on the coastal plain. The open, graminoid-dominated communities are often adjacent to Atlantic White Cedar (*Chamaecyparis thyoides*) swamps or Pitch Pine (*Pinus rigida*) lowlands. In addition to graminoid species, characteristic savanna vegetation includes an assortment of *Sphagnum* mosses, carnivorous plants, orchids, and low ericaceous shrubs. Various species of *Eriocaulon*, *Lobelia*, *Polygala*, and *Rhexia* have often been noted as prominent when *P. integra* was in bloom and many herbaceous plants that are rare in the state have been found in savanna habitat (Fox 1912, Frazee and Lunt 1934, Fables 1954, Walz et al. 2006, Ahern 2013, Johnson and Walz 2013, NJNHP 2024). Although the orchid is usually situated in places with an open canopy, Redles (1915) reported the unexpected discovery of a *P. integra* plant blooming in dense shade when he ducked into a cedar swamp seeking respite from what he described as "hordes of mosquitoes." One historical New Jersey occurrence was located in a brushy bog along a railroad corridor (NJNHP 2024).

Platanthera integra habitats in the southern states are comparable to those in New Jersey. They have been described as pine savannas and flatwoods, wet prairies, or hillside seepage bogs. The open sites may be seasonally flooded for short periods, and they are typically dominated by graminoid species and support an assortment of acid-loving carnivorous plants and low shrubs. Characteristic trees of adjacent forests are often pines such as *P. palustris*, *P. serotina*, or *P. elliotti* (Correll and Correll 1924, Massey 1953, Thorne 1954, Smith 1966, Platt et al. 1988, Liggio and Liggio 1999, Minno et al. 2001, Keddy et al. 2006, Morris 2013, Morrison 2014, Dixon et al. 2021).

Both hydrological characteristics and fire have played a role in forming and maintaining the open communities that are utilized by *Platanthera integra* throughout its range (Platt et al. 1988, Folkerts 1990, Walker 1993, Walz et al. 2006, Morris 2013, Morrison 2014), and the orchid itself has been described as a fire-dependent species (Hessl and Spackman 1995, Hardin et al. 2022). Bridges and Orzell (1989) noted that *P. integra* was most conspicuous following burns at sites in Georgia, Florida, and Mississippi, and a study the species' response to fire in Louisiana found that flowering increased at the majority of sites that had been burned the previous winter (MacRoberts and MacRoberts 1990).

Wetland Indicator Status

Platanthera integra is an obligate wetland species, meaning that it almost always occurs in wetlands (U. S. Army Corps of Engineers 2020).

USDA Plants Code (USDA, NRCS 2024b)

PLIN5

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 global range of *Platanthera integra* is mainly restricted to the southeastern United States (POWO 2024). The map in Figure 1 depicts the extent of the Yellow Fringeless Orchid in North America. The majority of *P. integra* populations are situated on the southeastern coastal plain, with disjunct occurrences in New Jersey and central Tennessee (Sorrie and Weakley 2001).

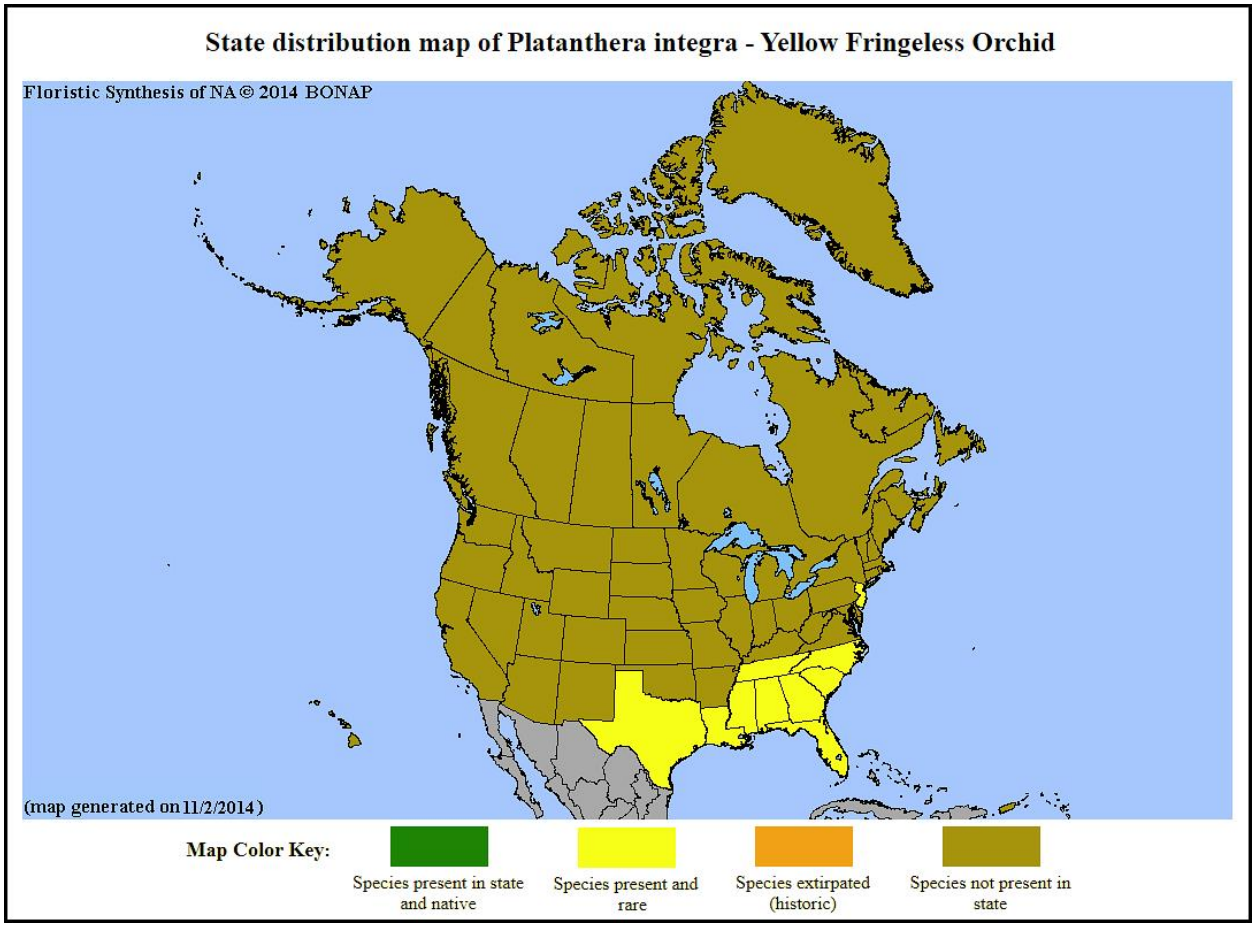


Figure 1. Distribution of P. integra in North America, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2024b) shows records of *Platanthera integra* in six New Jersey counties: Atlantic, Burlington, Cape May, Middlesex, Monmouth, and Ocean (Figure 2 below). Snyder (1984) noted that the Middlesex County record had been based on a misidentified specimen. The remaining county reports include historic observations and do not reflect the current distribution of the species.

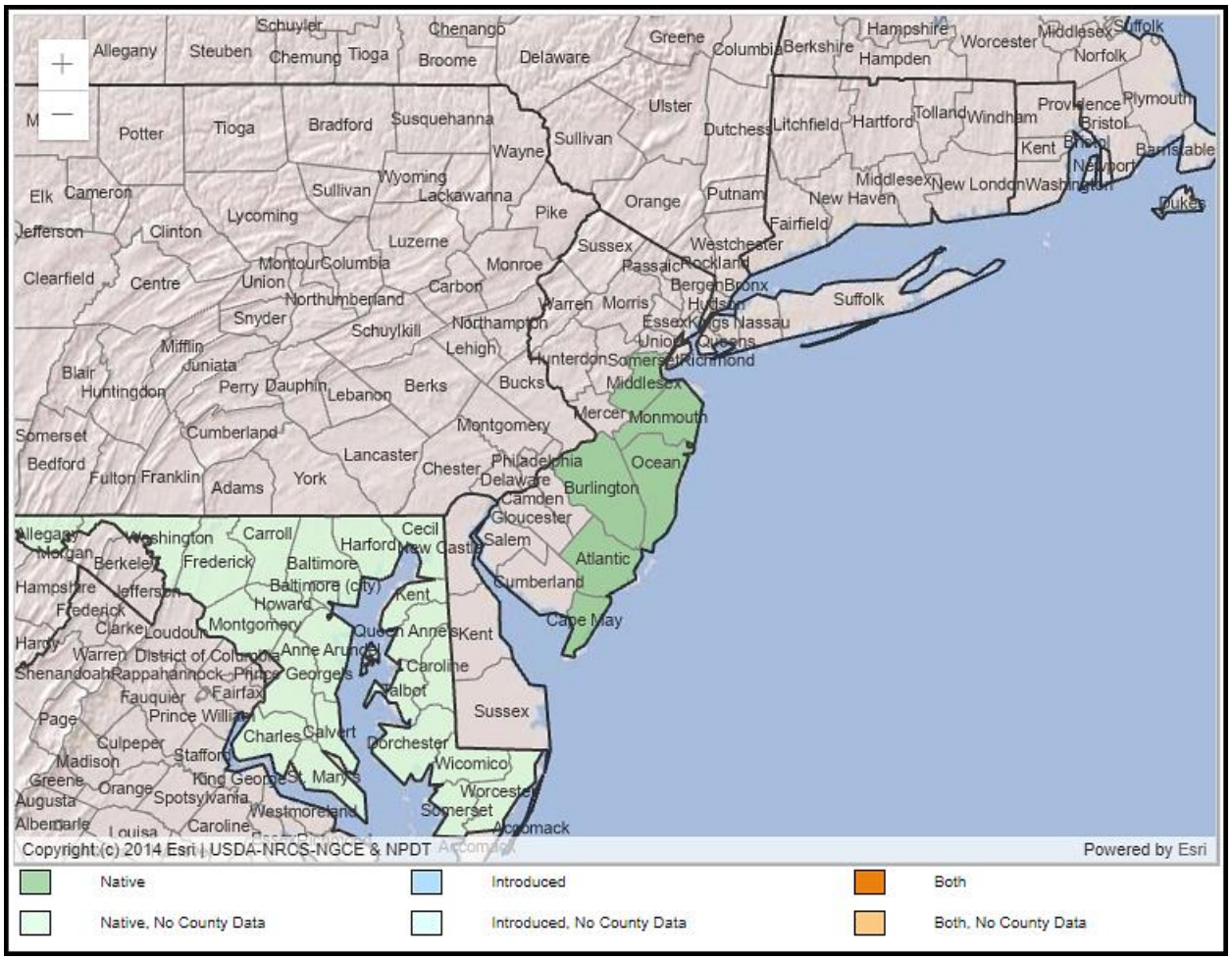


Figure 2. County records of P. integra in New Jersey and vicinity (USDA NRCS 2024b).

Conservation Status

Platanthera integra has a global rank of G3G4, meaning there is some uncertainty as to whether it is vulnerable or apparently secure. A G3 species has a moderate risk of extinction or collapse due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors. 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 local recent declines, threats, or other factors (NatureServe 2024). The map below (Figure 3) illustrates the conservation status of *P. integra* throughout its range.

During the first half of the twentieth century, *Platanthera integra* was reported as locally abundant at some sites in Alabama and Mississippi although it was rare throughout most of its range (Graves 1920, Correll 1940). At present, Yellow Fringeless Orchid is not considered secure in any of the states where it occurs. The species is vulnerable (moderate risk of extinction) in two states, imperiled (high risk of extinction) in two states, and critically imperiled (very high risk of extinction) in six states. Despite its rarity throughout the United States, *Platanthera integra* is not presently listed at the federal level (USFWS 2024b). The orchid was previously classified as a Category 2 species, indicating that listing may be appropriate but insufficient information was available regarding its biological vulnerability (USFWS 1993).

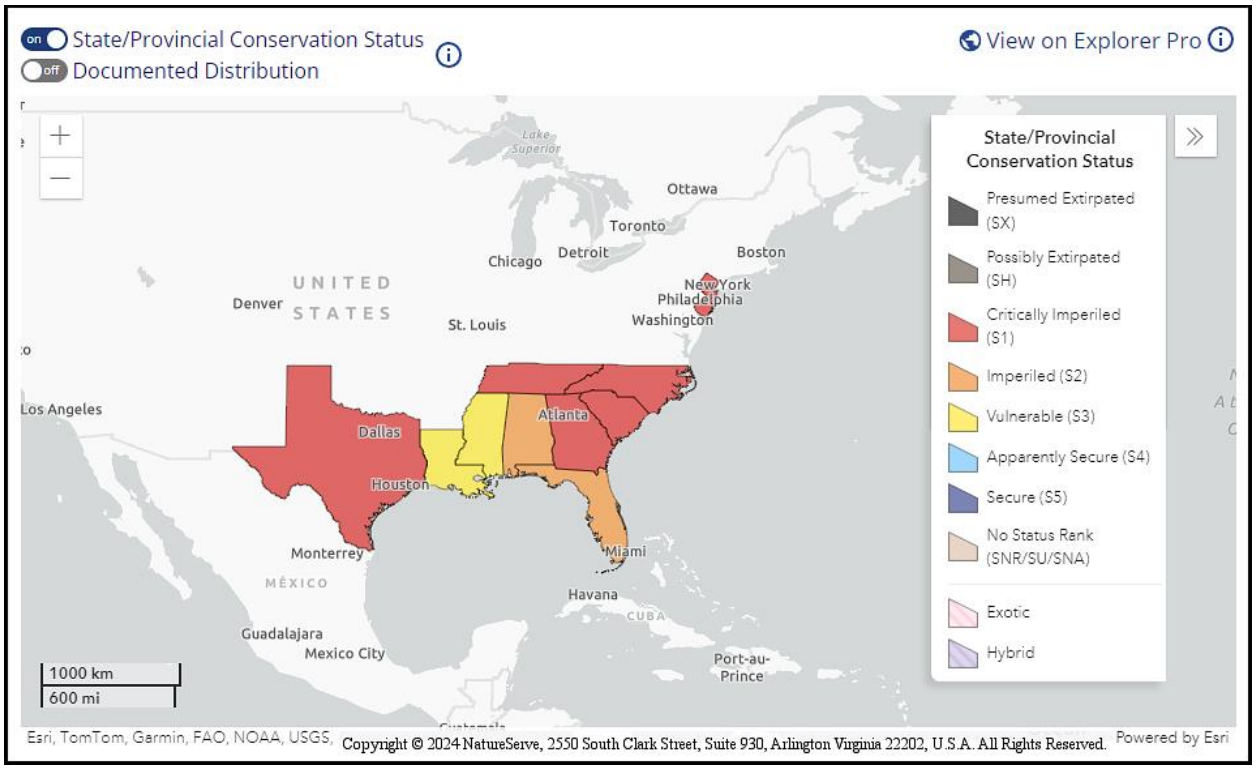


Figure 3. Conservation status of P. integra in North America (NatureServe 2024).

New Jersey is one of the states where *Platanthera integra* 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. integra* 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 Yellow Fringeless 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).

Platanthera integra was initially discovered in New Jersey during 1818 at a site in Atlantic County, and the orchid was subsequently reported in Burlington, Cape May, Monmouth, and Ocean counties. However, the Monmouth and Ocean records were later questioned due to a lack

of corroborating specimens (Britton 1889, Taylor 1910 & 1915, Stone 1911, Fables 1954). All of the early state floras characterized *P. integra* as rare and difficult to find. By the mid-1900s the orchid was thought to be heading for extinction in New Jersey (Fernald 1950) but several new populations were discovered by Fables (1954, 1957). *Platanthera integra* was one of the first plants to be listed as an endangered species in the state (Fairbrothers and Hough 1973, Calazza and Fairbrothers 1980, NJONLM 1984) and it was included on the original list of plant species targeted for conservation in the pinelands (NJ Pinelands Commission 1980). No New Jersey observations of *P. integra* have been made outside of Burlington County since 1932 (Hough 1983, NJNHP 2024). Five populations are thought to be extant in the state.

Threats

Habitat loss and/or degradation has long been, and continues to be, a significant threat the survival of *Platanthera integra* throughout its range. Savannas have been mined for bog iron and peat, flooded for cranberry farming, drained and planted with monocultures for commercial lumber, and utilized as pastures. Changes in hydrology that favor the establishment of generalist plant species over the rare seepage bog specialists have resulted from activities on adjacent land such as the creation of ponds or fire control ditches. There can be similar consequences at the microsite scale when ruts and ridges are created by the wheels of heavy equipment or off-road vehicles (Calazza and Fairbrothers 1980, Folkerts 1990, Harper et al. 1998, Johnson and Walz 2013, Hardin et al. 2022).

Even in the absence of anthropogenic disturbance, habitat loss can result from natural successional processes as communities dominated by woody species gradually replace the open herbaceous savannas. Succession may be hastened by fire suppression, imperiling species like *P. integra* that are restricted to the rare open herb-dominated wetland habitats. Fire suppression has been identified as one of the most significant current threats facing the orchid (Folkerts 1990, Harper et al. 1998, Johnson and Walz 2013, Hardin et al. 2022).

Platanthera integra is specifically vulnerable to destruction because it is so attractive in bloom. During the 1950s nearly all of the *P. integra* plants in one of New Jersey's largest populations were removed by a poacher. The culprit, locally referred to as John Vandal Doe, was a repeat offender: He was known as wealthy landowner from a suburb of New York City who would surreptitiously find out the location of rare plants and later send a crew to dig them up for transplantation to his personal garden, even though they were not likely to survive for more than a year or two (Philadelphia Botanical Club 1957, E. T. Wherry in Fables, 1957). Wild plant collectors are still noted as a threat to *P. integra*, and even well-meaning admirers occasionally trample the orchids when visiting their habitats (Hardin et al. 2022, NJNHP 2024).

In New Jersey, the overabundance of White-tailed Deer (*Odocoileus virginianus*) has been widely documented (NJDSR 2019) and that probably takes a toll on populations of *Platanthera integra*. Browsed individuals may be able to regenerate from tubers but the deer often nip off *P. integra* inflorescences before they can set seed and sometimes trample or uproot adjacent plants in the process (Fables 1954, NJNHP 2024). Loss of prospective offspring could accelerate the decline of small populations or occurrences in compromised habitats.

Another potential menace to *Platanthera integra* is thrips—tiny insects that can have an oversized impact on plants. The orchid was recently identified as a host plant for *Pseudothrips beckhami* in Florida (Funderburk et al. 2007). The range of the insect extends north to Massachusetts (Beshear and Howell 1976) so it could be present in New Jersey. The effects of thrips on another orchid (*Epipactis helleborine*) were studied by Light and Macconaill (2011). Thrips feeding damage may be limited to a light speckling of plant foliage, but heavy infestations can result in reproductive failure or desiccation.

Climate Change Vulnerability

An assessment of potential climate change impacts on selected New Jersey plants by Ring et al. (2013) ranked *Platanthera integra* as Presumed Stable because the authors found little evidence that the abundance or range of the species would substantially decrease by 2050 as a result of climactic conditions. As the global climate warms, New Jersey is experiencing higher temperatures and shifting precipitation patterns that are resulting in more extreme episodes of both heavy rainfall and drought (Hill et al. 2020). On the whole, Pine Barren savannas in the state are expected to remain relatively stable as conditions continue to change (Johnson and Walz 2013). However intense storms could have local impacts on certain *P. integra* populations. For example, some habitats in South Carolina were affected by storm surge or the deposition of woody debris during Hurricane Hugo (Bengtson et al. 1993), and one New Jersey site was flooded and covered by a layer of mud following Hurricane Irene (NJNHP 2024). Increases in annual rainfall totals might exacerbate existing threats from fire suppression (Hardin et al. 2022), although planned burns can help to mitigate those concerns (Johnson and Walz 2013). It is also possible that climate change could bring about changes in the abundance of thrips to the detriment of the orchids (Light and Macconaill 2011).

Management Summary and Recommendations

Platanthera integra only occurs in a narrow range of relatively rare plant communities so preservation of those habitats is critical for the long term conservation of the species. Most of the populations in New Jersey are located on protected lands, and access to one privately-owned site has been restricted by the landowner (Snyder 1993, NJNHP 2024). In addition to shielding the communities from direct disturbance, it is critical to maintain the natural hydrology and vegetative cover of the sites (Johnson and Walz 2013, FNAI 2022).

Calazza and Fairbrothers (1980) emphasized the importance of managing succession at sites where *Platanthera integra* occurs. While they suggested the manual removal of woody plants, fire appears to be an appropriate tool in savanna habitat. The orchid is generally viewed as a fire-dependent species, and Dixon et al. (2021) recently documented Yellow Fringeless Orchid on a wet prairie site that had been actively managed with fire for many years. There is evidence that winter burns are favorable for *P. integra* (Bridges and Orzell 1989, MacRoberts and MacRoberts 1990), and the species reportedly benefits from the implementation of prescribed burns at 2–3 year intervals (FNAI 2022).

It is difficult to make snapshot assessments of population viability because *Platanthera integra* is best identified in bloom and flowering rates can vary from one year to the next. Monitoring efforts should focus on the evaluation of habitat conditions and identification of potential threats. In small New Jersey occurrences of *P. integra*, herbivore exclusion might be necessary so that at least some of the plants have an opportunity to complete their reproductive cycle and disperse propagules.

Hardin et al. (2022) recommended range-wide surveys of historical sites and suitable habitats in order to gain better understanding of the species' abundance, threats, and trends. Moonier (2023) attempted to predict the locations of *Platanthera integra* occurrences using models but only met with marginal success—probably because the species is often absent even when suitable habitat is present. Careful and deliberate searches in the field are likely to be needed to find or relocate *P. integra* populations, but even then the orchid may be overlooked when it is growing with similar species such as *P. cristata* and *P. ciliaris* or amongst the brightly colored pitchers of *Sarracenia alata* (Holmes 1983).

The causes of perceived inconsistencies in the flowering rates or population sizes of *Platanthera integra* have not been adequately explained. It is possible that the slow-growing plants take several years to accumulate sufficient resources for the production of an inflorescence. Holmes (1983) suggested that the orchid might only flower in response to a narrow set of circumstances, and population fluctuations in *Platanthera* have also been attributed to climatic variations (POWO 2024). More detailed information is also needed requiring the pollinators of *P. integra* because the extent of its dependence on *Bombus pensylvanicus* for fertilization is unclear. A thorough understanding of the factors that govern reproduction in *P. integra* could lead to the development of more effective conservation strategies for the species.

Synonyms

The accepted botanical name of the species is *Platanthera integra* (Nutt.) A. Gray ex Beck. Orthographic variants, synonyms, and common names are listed below (ITIS 2024, POWO 2024, USDA NRCS 2024b).

Botanical Synonyms	**Common Names**
Gymnadeniopsis integra (Nutt.) Rydb.	Yellow Fringeless Orchid
Habenaria integra (Nutt.) Spreng.	Southern Yellow Orchid
Orchis integra Nutt.	Golden Frog Arrow
Gymnadenia flava Lindl.	Small Southern Yellow Orchis
Habenaria crocea (Raf.) Raf.	
Habenaria elliottii L. C. Beck	
Orchis crocea Raf.	
Perularia flava (Lindl.) Schltr.	

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