

Nymphaea odorata ssp. tuberosa

Tuberous White Water-lily

Nymphaeaceae



Nymphaea odorata ssp. tuberosa by J. S. Dodds, 2025

Nymphaea odorata ssp. tuberosa Rare Plant Profile

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State Parks, Forests & Historic Sites
Forests & Natural Lands
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Life History

Nymphaea odorata ssp. *tuberosa* (Tuberous White Water-lily) is a perennial aquatic plant in the Nymphaeaceae. People of a certain age may recall learning that flowering plants were classified as either Monocotyledons or Dicotyledons, and the water-lily family was formerly included in the latter group. However, Schaffner (1904) long ago observed that *Nymphaea* plants had some features that aligned with typical monocots and others that were characteristic of dicots, and as the 20th century unfolded new methods of analysis led to substantial changes in the angiosperm classification system (APG 1998). The Nymphaeaceae was transferred to a group loosely defined as the basal angiosperms, which is one of the earliest lineages of flowering plants and predates the emergence of both monocots and dicots. Subsequent revisions have placed the family in the Nymphaeales, which also includes the Cabombaceae and Hydatellaceae (Borsch et al. 2008, APG III 2009).

Nymphaea species are rooted, rhizomatous plants with floating leaves. In addition to having thick cuticles and stomata that are only present on the upper side of their leaves, adaptations to the aquatic environment include a conspicuous network of air canals that facilitate oxygen transport and promote buoyancy (Conard 1905, Kaul 1976, Etnier and Villani 2007). Richards et al. (2012) noted that *N. odorata* develops larger and more numerous air canals in the leaf petioles when growing at greater depths. The petioles of *N. odorata* ssp. *tuberosa* are highly elastic, which confers tremendous flexibility (Treitel 1944), and the vascular structure of water-lily leaves can help the plants withstand turbulent conditions. The tissue of *Nymphaea* species also contains numerous rigid cells with forking branches (idioblasts or sclerids) that may have a role in providing structural support (Conard 1905, Kaul 1976). The floral parts of *Nymphaea* tend to transition gradually from sepals to stamens. While the flowers are often noted as having four sepals, the sepals and petals may be collectively identified as tepals. A single tepal may contain both sepaloid (green) and petaloid (colorful) areas. The outermost tepals are generally more sepaloid, while the innermost ones are more petaloid, and the inner tepals morphologically grade into the stamens (Warner et al. 2008).



Left: Britton and Brown 1913, courtesy USDA NRCS 2025a. Right: J. S. Dodds, 2025.

The rhizomes of *Nymphaea odorata* ssp. *tuberosa* have lateral branches that are strongly constricted at the base, forming detachable tubers which may occur singly or in clusters of 2–5. Mature tubers may be up to 8 cm long and 2 cm wide. In addition to serving as storage organs they can also function as a means of dispersal. The large leaves (1–4 dm diameter) arise on long, sturdy petioles that are green and characteristically marked with brown-purple stripes near the top, although Ontario populations studied by Bayly and Jongejan (1982) included plants with unstriped petioles. The leaves are smooth-margined and nearly round with a single narrow sinus that extends to the base, and their undersides are green or faintly purple with prominent veins. A single flower may have 35–120 yellow stamens and 17–43 petals. The petals are usually white but pink forms are known. The fruits develop underwater, producing smooth, olive-brown seeds that are 2.8–4.5 mm in diameter. (See Hooker 1881, Conard 1905, Britton and Brown 1913, Fernald 1950, Wiersema and Hellquist 2020). Detailed descriptions of petiole structure, vasculature and floral development, and root core attributes are available from Treitel (1944), Moseley (1961), and Seago (2002) respectively.



Left: Tuber and leaf underside, J. S. Dodds 2014. Right: Seed coats by Jose Hernandez, courtesy USDA NRCS 2025b.

Paine (1865) first described the Tuberous White Water-lily as a variety of *Nymphaea odorata* with inodorous flowers. It was soon widely accepted as a separate species (*N. tuberosa*). *N. odorata* was noted to differ from *N. tuberosa* in having strongly scented flowers, purple leaf undersides, solid-colored (often dark) petioles, and rhizomes without prominent tubers (Sargent 1888, Conard 1905, Fassett 1957, Fairbrothers and Moul 1965). Some botanists found the distinctions between *N. odorata* and *N. tuberosa* to be less clear. Conard (1916) discussed the difficulty of separating them without fresh material and complete specimens and suggested that it might not be possible to maintain the species status; Adams (1929) found a mixed population in New Jersey; and Monson (1957) concluded that *Nymphaea* plants in Minnesota represented a single, highly variable taxon. Another study using material from New Jersey plants determined that the two water-lilies had similar chemical profiles (Riemer and Toth 1970). Wiersema and Hellquist (1994) relegated *tuberosa* to subspecies status, concluding that *N. odorata* was a polymorphic species with two predominant forms. Subsequent molecular studies concurred that

tuberosa did not warrant a species rank but supported separation at the subspecies level (Woods et al. 2005a, 2005b). The nearest relatives of *Nymphaea odorata* are *N. alba*, *N. candida*, *N. tetragona*, and *N. mexicana*; and it is possible that *N. odorata* ssp. *tuberosa* originated from hybridization between *N. odorata* and *N. mexicana* (Borsch et al. 2007). The aforementioned characteristics traditionally used to separate *N. odorata* and *N. tuberosa* can be helpful in distinguishing the subspecies of *Nymphaea odorata*, and the typical form (ssp. *odorata*) also has smaller seeds (1.5–2.5 mm). Nevertheless, the distinctions break down in some populations and the identification of plants with intermediate features is best left at species level (Wiersema and Hellquist 2020). The frequent planting of *N. odorata* cultivars may introduce further confusion, as they can spread rapidly and hybridize with native strains (Rhoads and Block 2007).

Nymphaea odorata ssp. *tuberosa* blooms more or less continuously from late July through September and the fruits can develop from July through October (Conard 1905, Hough 1983, Wiersema 1998, Weakley et al. 2024). Muenscher (1936) collected mature seeds from plants in New York during mid-August. Individual *Nymphaea* flowers last for several days but they open and close on daily cycles. While some are nocturnal, *N. odorata* belongs to a group of day-blooming species (Wiersema 1988). On sunny days the flowers of *N. odorata* ssp. *tuberosa* usually expand around eight o'clock in the morning and remain open until early afternoon but they may open and close several times on overcast days (Sargent 1888). Observations on the responses of cut flowers led Conard (1905) to conclude that the process was driven by light.

Light availability also governs the formation of leaves. The floating leaves of aquatic plants have an average life span of 13–35 days although those of some species (e.g. *Nymphaea tetragona*) have been known to last for up to 55 days (Tsuchiya 1990). They are continually replaced throughout the growing season. In addition to its floating leaves, *Nymphaea odorata* produces aerial leaves that are held up above the surface. New leaves are formed underwater, and as the petioles elongate the blades of floating leaves begin to unfurl as they approach the surface but those of aerial leaves remain tightly coiled until they have fully emerged. Early in the growing season floating leaves are prevalent while aerial leaves are most abundant during mid-season. Aerial leaf production appears to be triggered by reduced light once 30–40% of the water's surface is occupied by floating leaves. Unfurled leaves and reinforced petioles help the aerial leaves to break through the cover, and Treitel (1944) pointed out that the flexibility of the petioles allows each leaf to be positioned for maximal light exposure. As the season progresses replacement levels drop and floating leaves once again become prevalent until they disappear altogether in the fall (Etnier and Villani 2007, Villani and Etnier 2008, Etnier et al. 2017). In Wisconsin it was noted that senescence of *N. odorata* ssp. *tuberosa* leaves was complete by mid-November. The water-lilies remained dormant under a layer of ice throughout the winter, during which time all light was effectively extinguished by an accumulation of snow, and new leaves began to appear at the surface the following April (Smart 1977).

Pollinator Dynamics

The flowers of plants in the water-lily family lack a style. Instead, the upper surfaces of the ovarian carpels form a large, disc-shaped stigma and they secrete a sweet liquid that accumulates in the basin (Zomlefer 1994). The stigmatic fluid of *Nymphaea odorata* has a sugar

concentration of 3% (Meeuse and Schneider 1979), although insects such as bees, flies, and beetles are mainly attracted to the flowers by their pollen (Robertson 1889). While *N. odorata* ssp. *odorata* is appreciated for its lovely fragrance, ssp. *tuberosa* is essentially odorless.

As noted in the previous section, *N. odorata* flowers open and close for several consecutive days. On the first day the flowers are exclusively pistillate and actively secreting fluids so they can receive pollen from other flowers before their own anthers are releasing it. On subsequent days the stigma is dry and the anthers are shedding pollen. The older flowers in a population open earlier in the morning so by the time the pistillate flowers expand insects are likely to be covered with pollen from the functionally staminate flowers. The inner stamens bend under the weight of the visitors and drop them into the fluid-filled disc. The pollen is washed off in the fluid, and some pollinators escape but many fail to get out alive (Robertson 1889, Conard 1905). The pH of the stigmatic fluid is close to optimal for pollen germination (Meeuse and Schneider 1979) and that usually takes place within 15 minutes, while pollen tube development and fertilization of the ovules is generally complete after two or three hours (Williams et al. 2010). When a flower has finished its blooming cycle the peduncle bends, often forming spiral coils, and draws it beneath the surface. Unfertilized flowers disintegrate rapidly when they are just below the surface but fertilized flowers are held above the substrate in the water column where they develop into fruits (Conard 1905). Although the temporal separation of the male and female phases prevents self-fertilization within an individual *N. odorata* flower, the transfer of pollen between clones is likely to occur frequently because of the high rate of vegetative reproduction in the species.

Due to structural differences in their pollen, night-blooming *Nymphaea* species are generally beetle-pollinated while the primary pollinators of the day-blooming species are bees and flies (Wiersema 1988). Beetles may occasionally pollinate *Nymphaea odorata* ssp. *tuberosa*—several were observed on the flowers by Robertson (1889), including one that had drowned in the stigmatic fluid. The majority of insects recorded on Tuberous White Water-lily have been bees (*Agapostemon*, *Augochlora*, *Halictus*, *Hylaeus*, and *Lasioglossum* spp.) and flies (*Atrichopogon*, *Helophilus*, *Notiphila*, *Parhelophilus*, *Sparnopolius*, *Tanytarsus* spp.) (Robertson 1889, Conard 1905, McGaha 1952, Meeuse and Schneider 1979, Hilty 2020).

Several bees (*Hylaeus nelumbonis*, *Lasioglossum nelumbonis*, and *Lasioglossum nymphaearum*) were thought to be oligolectic on plants in the Nymphaeaceae (Hilty 2020) but those species have also been recorded on flowers from other families (Fowler 2016, BugGuide 2025). Honey bees (*Apis mellifera*) visit *Nymphaea odorata* but records from multiple locations indicated that they avoided the first-day flowers with stigmatic liquid present and only collected pollen from older flowers, thus making no contribution to cross-fertilization (Meeuse and Schneider 1979). However, effective pollen transfer by honeybees has apparently been documented in the related *N. mexicana* (Williams et al. 2010). Other generalist bees noted as visitors to *Nymphaea* flowers include species of *Bombus* and *Dialictus* (Stubbs et al. 1992).

Seed Dispersal and Establishment

Water is the primary dispersal mechanism for *Nymphaea*. Upon reaching maturity, water-lily fruits split open and the seeds are released underwater. *Nymphaea* seeds have a bell-shaped appendage (aril) that traps air bubbles, causing them to rise to the surface when they are freed from the fruits. The seeds float for a while but eventually their arils become detached and they promptly sink (Conard 1905, Smits et al. 1989, Zomlefer 1994, Richards and Cao 2012). *N. odorata* ssp. *tuberosa* can produce 60–70 seeds per fruit and Conard (1905) noted that the arils in that subspecies are shorter than the seeds, whereas they are longer than the seeds in ssp. *odorata*. Reliance on water dispersal means that the majority of the propagules are distributed locally. *Nymphaea odorata* ssp. *tuberosa* seeds are often consumed by waterfowl and marsh birds, which are known to function as long-distance dispersal agents for some other aquatic plants (Fassett 1957, Nichols 1986, Smits et al. 1989). During a study in the Netherlands which included *Nymphaea alba*, waterfowl and carp that ate water-lily seeds digested them completely so no dispersal resulted (Smits et al. 1989), but the authors pointed out that other vertebrate species with less efficient digestive apparatus might distribute viable seeds.

Nymphaea seeds must remain wet to retain their viability (Muenscher 1936, Smits et al. 1989). Conard (1905) indicated that *N. odorata* seeds needed to be submerged in 5–30 cm of water in order to germinate, and Richards and Cao (2012) demonstrated that they germinated equally well at depths of 30, 60, or 90 cm. Muenscher (1936) found that germination rates were improved by a period of exposure to cool temperatures. Temperatures of 65–77°F are optimal for the germination of *N. odorata* seeds (Conard 1905, Dhara Seeds 2025). In natural settings they probably sprout in response to seasonal temperature changes, and possibly also to an increase in day length, although some can remain dormant in the substrate for several years (Conard 1905, Richards and Cao 2012).

Nymphaea odorata ssp. *tuberosa* is also dispersed vegetatively by the detachable tubers and those may serve as the species' primary means of reproduction. Conard (1905) observed that "*when one wades among the plants, great numbers of the tubers are detached, and float to the surface of the water; thus the plants are distributed and will in short time take complete possession of a small pond.*" A variety of mammals use *N. odorata* rhizomes as a food source and it is likely that they dislodge tubers in the process of foraging (Conard 1905, Fassett 1957). The Tuberous White Water-lily's ability to proliferate once it becomes established have sometimes led to its being regarded as a local nuisance (Nichols 1986). A seed bank study by Schneider (1994) confirmed that regenerative structures of *N. odorata* were present in the substrate but it was not clear whether the plants that emerged during her experiment originated from seeds or tubers. It is noteworthy that the young water-lily plants in the study developed regardless of whether standing water was present above the soil surface.

N. odorata ssp. *tuberosa* seedlings and young plants that are resprouting from tubers follow similar developmental pathways. In seedlings the first leaf to appear is bladeless and the second is narrow and unlobed. The subsequent leaves, like those produced by regenerative tubers, occur in a variety of forms—many of the early blades are hastate or sagittate. The first floating leaf of the season is rounded and its petiole elongates abruptly (Conard 1905, Nieuwland 1916, Richards and Cao 2012). Brundrett (1999, 2002) reported the presence of vesicular-arbuscular

mycorrhizae in an Australian *Nymphaea* but it is not clear if they are present in any of the North American water-lilies.

Habitat

Nymphaea odorata ssp. *tuberosa* grows at elevations of 100–400 meters above sea level. The water-lily inhabits lakes and ponds, and it may occasionally be found in sluggish sections of rivers or streams. The species favors mildly to moderately alkaline waters over deep, mucky, organic sediments (Moyle 1945, Smart 1977, Wiersema and Hellquist 2020, NJNHP 2024). Wilcox and Simonin (1987) recorded a mean sediment depth of 2.7 dm at a site where Tuberous White Water-lily was growing in Lake Michigan, and average water depths of 4–10 dm have been reported there and elsewhere (e.g. Smart 1977, Niemeier and Hubert 1984). McGaha (1954) observed that *N. odorata* ssp. *tuberosa* tended to grow in deeper and more exposed sites than *N. odorata* ssp. *odorata* but that is not always the case. For example, the subspecies was noted as a prominent component of the aquatic vegetation in a channel between two lakes that only contained water during years when the water table was high (Crow 1969) and at another site it was seen growing in protected sites along the shoreline as well as out in deeper waters (Whyte et al. 2003).

Weakley et al. (2024) assigned a heliophily rank of 5 to *N. odorata* ssp. *tuberosa*, indicating that it is equally likely to thrive in full sun or dense shade. It appears to be more shade tolerant than ssp. *odorata*, for which the rank of 8 signifies a strong preference for open situations. *N. odorata* ssp. *tuberosa* is reportedly able to endure turbidity (Engel and Nichols 1994) and eutrophic conditions (Niemeier and Hubert 1984). The flexible petioles help the plants to withstand wave action, although the deep leaf notches may make the leaves more prone to tearing in rough waters (Treitel 1944, Klarer and Millie 1992).

Nymphaea odorata ssp. *tuberosa* often co-occurs with other floating-leaved aquatic plants like pond-lilies (*Nuphar* spp.) or American Lotus (*Nelumbo lutea*) (Crow 1969, Klarer and Mille 1992, Engel and Nichols 1994, Whyte et al. 2003). At one site it was co-dominant with *Ceratophyllum demersum*, which is a submerged and free-floating species (Lind and Cottam 1969). The water-lily conducts photosynthesis at a rapid rate, which enables it to compete with other surface-leaved species that emerge earlier in the season (Hough and Filbin 1990). Some potential competitors are shaded out when *N. odorata* leaves cover the surface, while the growth of others may be inhibited by allelopathic compounds produced in the water-lily's leaves, stems, roots, and rhizomes (Lind and Cottam 1969, Elakovich 1989, Gopal and Goel 1993, Whyte et al. 2003). In places where the Water Chestnut (*Trapa natans*) has been introduced *Nymphaea odorata* can initially outcompete the intruder but also appears to stimulate its seed production rate, which can ultimately exacerbate its spread (Monacelli and Wilcox 2021).

Wetland Indicator Status

Nymphaea odorata is an obligate wetland species, meaning that it almost always occurs in wetlands (U. S. Army Corps of Engineers 2022).

USDA Plants Code (USDA, NRCS 2025c)

NYODT

Coefficient of Conservancy (Walz et al. 2020)

CoC = 6. 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 native range of *Nymphaea odorata* ssp. *tuberosa* is restricted to the central and eastern United States and Canada (POWO 2025). The map in Figure 1 depicts the extent of the subspecies in North America.

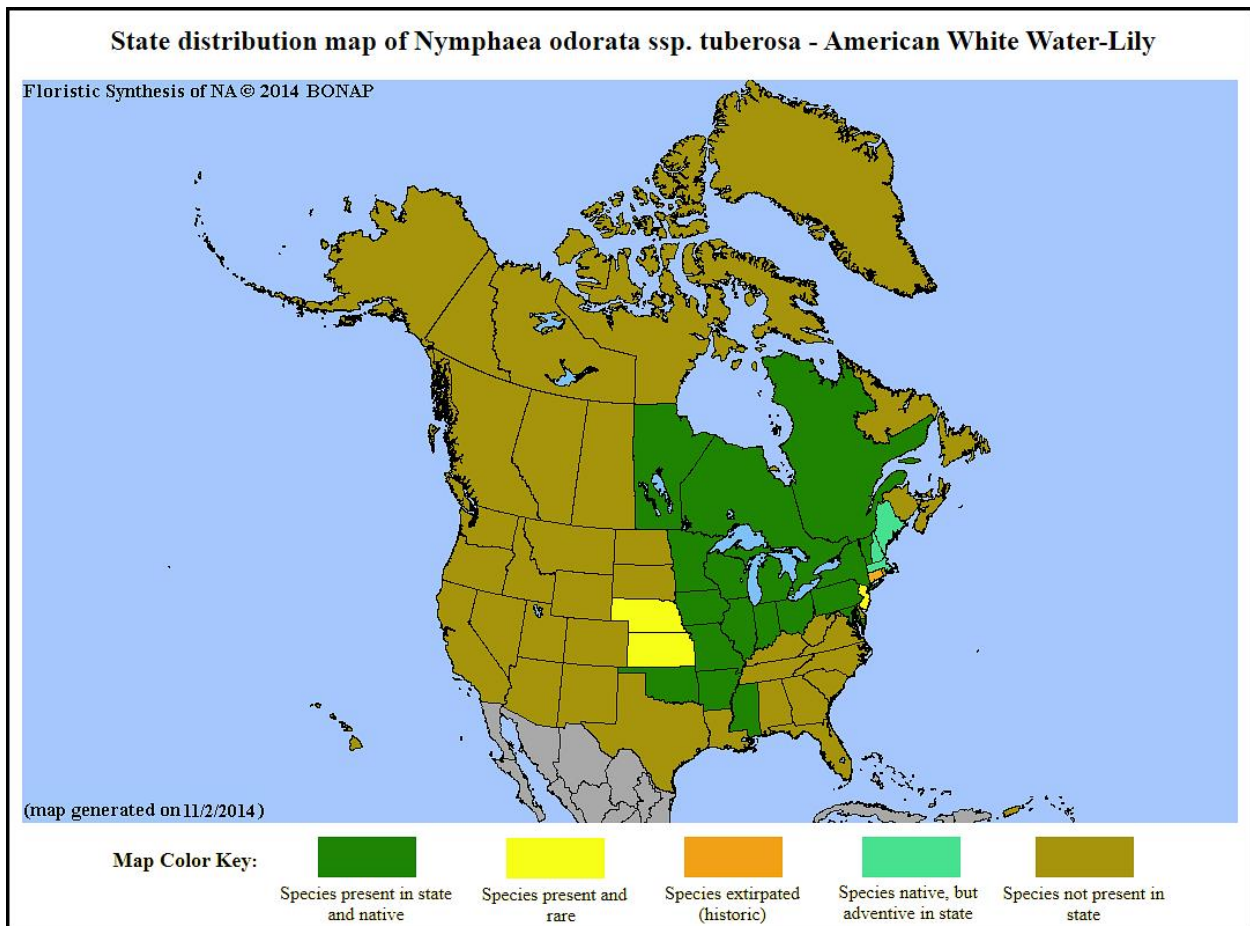


Figure 1. Distribution of *N. odorata* ssp. *tuberosa* in North America, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2025c) shows records of *Nymphaea odorata* ssp. *tuberosa* in six New Jersey counties: Bergen, Burlington, Cape May, Mercer, Morris, and Sussex (Figure 2). The subspecies has also been reported in Atlantic, Camden, and Ocean counties although the Camden County occurrence was deliberately introduced (Adams 1929, Mid-Atlantic Herbaria 2025). The data include historic observations and do not reflect its current distribution.

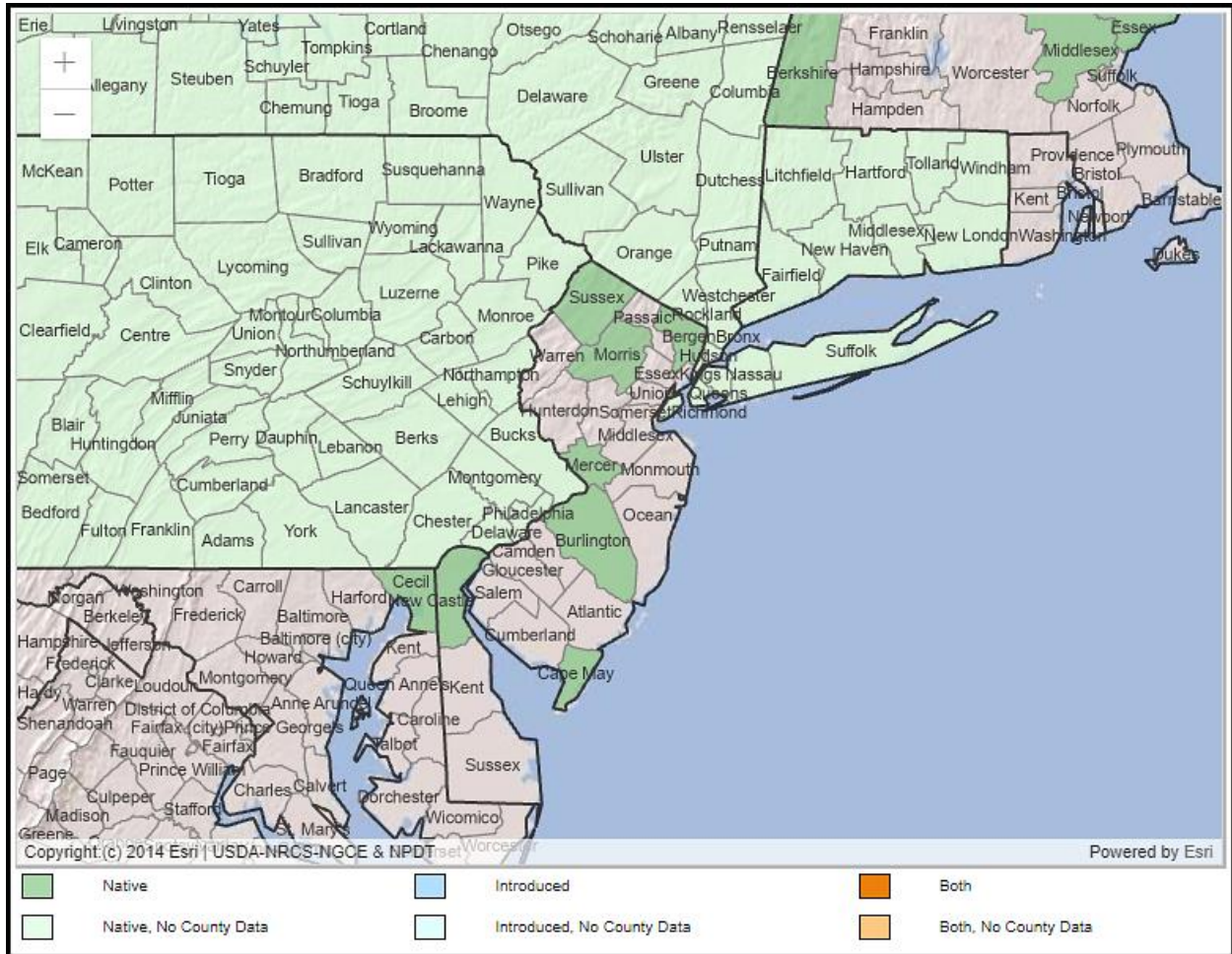


Figure 2. County records of *N. odorata* ssp. *tuberosa* in New Jersey and vicinity (USDA NRCS 2025c).

Conservation Status

Nymphaea odorata ssp. *tuberosa* is considered globally secure. The G5T5 rank means the subspecies 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 the Tuberous White Water-lily throughout its range. *N. odorata* ssp. *tuberosa* is vulnerable (moderate risk of extinction) in one province and one state and critically imperiled (very high risk of extinction) in one province and two states. The subspecies is secure, apparently secure, or unranked throughout much of its

range. It is rare but generally not regarded as native in Massachusetts, where it was not known to occur prior to the 1960s (Seymour 1963, Coddington and Field 1978, Hickler et al. 2018).

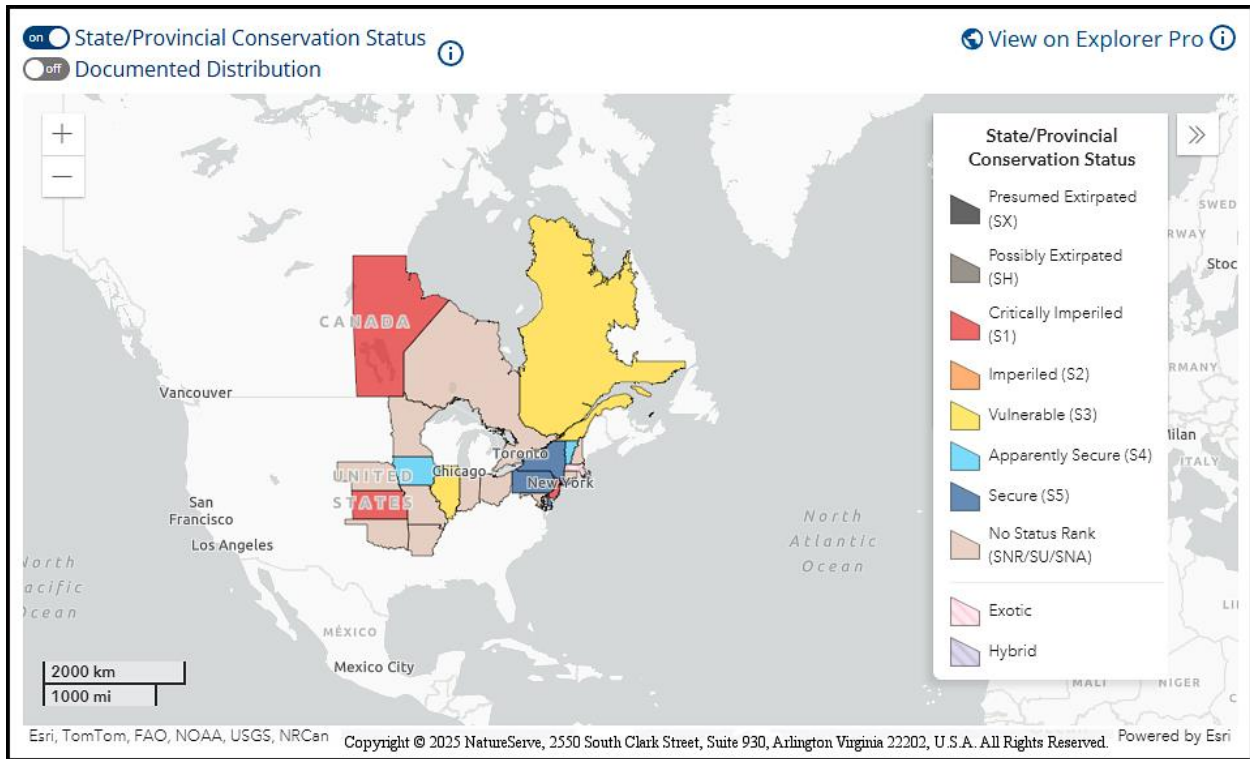


Figure 3. Conservation status of *N. odorata ssp. tuberosa* in North America (NatureServe 2025).

Nymphaea odorata ssp. tuberosa 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. The water-lily has also been assigned a regional status code of HL, signifying that it is eligible for protection under the jurisdiction of the Highlands Preservation Area (NJNHP 2010).

Abbott (1888) first reported the presence of *Nymphaea odorata ssp. tuberosa* in New Jersey after his attention was drawn to the unusual characteristics of a water-lily colony in Mercer County. Conard (1905, 1916) documented it at a second Mercer County site and Taylor (1915) said that there was also a verified occurrence in Cape May County. Adams (1929) found *N. odorata ssp. tuberosa* growing in a Camden County stream: Having noted the presence of tubers and the green undersides of the leaves he sent a specimen to the Gray Herbarium and his identification was confirmed. Upon learning that the uncommon water-lily had been introduced at the Camden County site by a resident who tossed a tuber into the waterway he investigated further and determined that the source material had come from a location in Ocean County. Adams subsequently visited the site of origin and found a mixed population containing both subspecies. By the early 1980s all of the records from Mercer and Cape May counties were over 50 years old but there were more current reports from Bergen, Burlington, Morris, and Sussex counties (Hough 1983). *N. odorata ssp. tuberosa* was initially listed as an S2 species but the status was later revised to S1 (NJNHP 2001, 2021). Only two populations are known to be extant in the

state (NJNHP 2024). However, *Nymphaea odorata* ssp. *odorata* is fairly common in New Jersey so it would be easy to overlook the less common subspecies without careful examination of water-lily populations.

Threats

Many large mammals eat the rhizomes of *Nymphaea odorata* ssp. *tuberosa*, including beaver, deer, moose, muskrat, and porcupine (Fassett 1957). Excessive herbivory during the winter months could take a toll on water-lily populations and the increasing number of beavers has been noted as a concern for the species (Ventrella 2025). However, most of the threats facing the Tuberous White Water-lily result from human activity. Throughout its range, populations of *N. odorata* ssp. *tuberosa* have been affected by development, changes in hydrology, pollution and siltation, resource extraction (including logging and wild rice harvesting), boating, introduced flora and fauna (e.g. *Lythrum salicaria*, *Phragmites australis* ssp. *australis*, *Cyprinus carpio*), and the use of herbicides (McGaha 1952, Chow-Fraser et al. 1998, Ventrella 2025). Road runoff was identified as a potential threat to one New Jersey occurrence of the water-lily (NJNHP 2024). *N. odorata* ssp. *tuberosa* was formerly collected in the wild for horticultural purposes but most garden centers now sell cultivated stock (Ventrella 2025), which could introduce different genetic strains into natural populations.

Although the allelopathic compounds in *Nymphaea odorata* might help to limit the spread of some non-native invasive species in its vicinity (Elkaovich 1989, Monacelli and Wilcox 2021), the water-lily itself is sometimes viewed as a 'native nuisance' because it tends to form a monoculture and its dense growth can interfere with recreational activities such as boating or swimming (Desmarais 2016, Lazaro-Lobo et al. 2024, Baker 2025). In New Jersey, a once-vigorous population containing thousands of *N. odorata* ssp. *tuberosa* plants experienced a severe decline following weed eradication efforts that employed a combination of harvesting and herbicide applications (NJNHP 2024). Even when the water-lily is not the intended target of management activities it is sensitive to many of the herbicides that are used to control other troublesome aquatic plants (Nichols 1986, Lazaro-Lobo et al. 2024).

Threats to *Nymphaea odorata* ssp. *tuberosa* from pests or diseases appear to be minimal. Many different insects feed on the plants' floral petals, floating or submerged leaves, petioles, and roots. Occasionally a concentration of beetle larvae (*Bagous* spp.) in the petioles can result in leaf collapse but insect activity does not generally pose a threat to healthy water-lily populations (McGaha 1954, Harms and Grodowitz 2009). One leaf-spot fungus (*Dichotomophthoropsis nymphaearum*) was isolated from leaves of *N. odorata* ssp. *tuberosa* plants in Minnesota (Johnson and King 1976), although it does not seem to be a widespread concern. Gopal and Goel (1993) detected antimicrobial compounds in Tuberous White Water-lily that might help reduce the species' susceptibility to disease.

Climate Change Vulnerability

Information from the references cited in this profile was used to evaluate the vulnerability of New Jersey's *Nymphaea odorata* ssp. *tuberosa* populations to climate change. The subspecies 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 the state climactic computations by Ring et al. (2013). Based on available data the Tuberous White Water-lily was assessed as Moderately Vulnerable, meaning that it is likely to show some decrease in abundance or range extent in New Jersey by 2050.

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 contributing to unpredictable weather patterns that result in both more frequent flooding events and prolonged periods of drought (Hill et al. 2020). Lake ecosystems in general are likely to experience higher water temperatures, changes in water depth, or altered levels of productivity as a result of climate change (Kling et al. 2003). Experimentation by Muenscher (1936) suggested that the seeds of *Nymphaea odorata* ssp. *tuberosa* might require a lengthy exposure to cold (34–37°F) in order to break dormancy, so warmer winter conditions could interfere with germination and seedling establishment. Seeds could lose their viability during periods of extended drought, and both increased and decreased water levels have reportedly had detrimental impacts on established water-lily populations (Stuckey 1971, Cooke 1981). In addition to the direct effects of climate change, threats to native communities from invasive plants are expected to be amplified as temperatures continue to rise (Bellard et al. 2013, Salva and Bradley 2023).

Management Summary and Recommendations

Established populations of *Nymphaea odorata* ssp. *tuberosa* are likely to persist for many years as long as their habitats remain intact. Conservation efforts for the water-lily should focus on maintaining the integrity of ponds or lakes where the species is growing. Relatively stable water levels appear to be important, and where it is possible buffers are advisable to limit the introduction of sediments or pollutants into the aquatic systems. Although *N. odorata* ssp. *tuberosa* seems to be a fairly strong competitor, the proliferation of monoculture-forming species like *Phragmites* should be deterred and *Trapa natans* might become a problem if it is allowed to spread unchecked. The use of herbicides should be avoided in sites that support Tuberous White Water-lily, as should human activities that directly damage the plants.

Only two populations of *Nymphaea odorata* ssp. *tuberosa* are currently tracked in New Jersey and it is not clear whether other sites where the subspecies was historically reported have been searched. It is possible that additional occurrences in the state have been overlooked because it so closely resembles the more widespread *Nymphaea odorata* ssp. *odorata*.

Synonyms

The accepted botanical name of the species is *Nymphaea odorata* ssp. *tuberosa* (Paine) Wiersema & Hellquist. Orthographic variants, synonyms, and common names are listed below (ITIS 2025, POWO 2025, USDA NRCS 2025c). Gleason and Cronquist (1991) treated *N. tuberosa* as a synonym of *N. odorata*.

Botanical Synonyms

Nymphaea tuberosa Paine
Nymphaea tuberosa var. *maxima* Conard ex L. H. Bailey
Nymphaea odorata var. *maxima* (Conard) B. Boivin
Nymphaea spiralis Raf.
Castalia spiralis (Raf.) Cockerell
Castalia tuberosa (Paine) Greene
Leuconymphaea tuberosa (Paine) Kuntze

Common Names

Tuberous White Water-lily
American White Waterlily

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