

# *Veronica catenata*

Sessile Water-speedwell

Scrophulariaceae



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*Veronica catenata* by Peter M. Dziuk, 2011

## ***Veronica catenata* 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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## Life History

*Veronica catenata* (Sessile Water-speedwell) is an aquatic or semi-aquatic herb. *Veronica* has traditionally been included in the Scrophulariaceae but genetic analysis of the figwort family resulted in the reassignment of the speedwells to the Plantaginaceae (Olmstead and Reeves 1995, Olmstead et al. 2001, APG II 2003). Although *Veronica catenata* is generally identified as a perennial, the species can adopt an annual strategy in certain habitats (Salisbury 1970, Callaghan 1998).

The stems of *Veronica catenata* are 15–60 cm high and mostly smooth although there are sometimes glandular hairs near the top. When growing in shallow water the lower portion of the stem may creep on the substrate, rooting at the nodes. The leaves are opposite, clasping at the base, and have margins that are smooth or nearly so. Aerial leaves are usually 2.5–5 times as long as wide, averaging 2.5–5 cm in length and 1–15 mm in width. Submersed leaves, when present, are proportionally longer and thinner, reaching up to 12 cm in length and 20 mm in width. Floral racemes bearing 15–25 flowers develop in the axils of the upper leaves. Each flower is held on a pedicel 5–10 mm in length and has four sepals that are 2.5–3 mm long and four petals, the lowest of which is smaller than the others. Flower color may be white or pale pink with darker lines that do not reach the margins of the petals. The flattened capsular fruits are wider (3–4 mm) than high (2.5–3 mm) and they are usually distinctly notched at the top. (See Pennell 1921, Fernald 1950, Winterringer and Lopinot 1966, Gleason and Cronquist 1991, Albach 2020). *V. catenata* may flower during the spring, summer, or fall (Albach 2020, Weakley et al. 2022).



Peter M. Dziuk, 2011



Peter M. Dziuk, 2005

*Veronica catenata* is closely related to *Veronica anagallis-aquatica* (Ellmouni et al. 2018, Albach 2020) and sterile hybrids of the two species have been reported (eg. Brooks 1976, Heckard and Rubtzoff 1977). *V. catenata* and *V. anagallis-aquatica* are morphologically similar and the two speedwells are often confused (Albach 2020). When the plants grow as submerged aquatics they cannot be visually distinguished (Bowles and Dodd 2015). The characteristics of mature plants can overlap to some extent so it is helpful to examine multiple features when making a species determination. In general, the leaves of *V. anagallis-aquatica* are usually less than three times as long as wide and more likely to be toothed along the margins, the floral

racemes typically bear more numerous flowers (20–65), the flowers are slightly larger and tend to be bluer in color, and the fruits are nearly equal in height and width (Snyder 1989, Albach 2020, Weakley et al. 2022).

### **Pollinator Dynamics**

The majority of *Veronica* species have unscented flowers (Genders 1977) but they do produce nectar and thus attract pollinators (Hilty 2020). It is possible that the dark lines on *V. catenata* petals serve as nectar guides. Insects that have been observed visiting the flowers of various *Veronica* species include an assortment of flies, bees, and butterflies (Stubbs et al. 1992, Scott 2014, Hilty 2020). In Japan *V. anagallis-aquatica* is pollinated by hoverflies (Syrphidae), while other small flies (Drosophilidae, Chironomidae) have been reported as pollinators for a different speedwell (Saito and Kadono 2021). Although several butterfly species (*Callophrys gryneus siva*, *Euphyes vestris*, *Pieris rapae*) have been documented visiting the flowers of *Veronica catenata* the importance of their role in pollination is unclear (Scott 2014).

### **Seed Dispersal and Establishment**

A *Veronica catenata* plant can have 10–25 racemes of 15–25 flowers, each of which is capable of producing 26–123 small seeds (Albach 2020). Salisbury (1970) estimated the average annual seed output for a single *V. catenata* plant at 22,760 ( $\pm$  2,460) and reported an approximate seed production of 87,000 for the largest plant he observed.

Sessile Water-speedwell can utilize multiple dispersal mechanisms. Panter and Dolman (2012) inferred wind dispersal as the primary strategy for the species based on small seeds that are shed from a capsule which is held up above much of the surrounding vegetation. Schwab et al. (2018) reported the water dispersal of *V. catenata* seeds. Some propagules are probably distributed by herbivores: Seeds of *V. catenata* have been found in the digestive tracts of dabbling ducks (Green et al. 2016) and retrieved from the dung of large mammals including cattle, wild ponies, and deer (Mouissie et al. 2005, Stroh et al. 2011, Panter and Dolman 2012). Humans have also played a role in long-distance dispersal—viable *V. catenata* seeds were unintentionally included in multiple brands of commercial potting soil mixtures, resulting in their transport over distances up to 364 kilometers (Sonkoly et al. 2022).

*Veronica catenata* seeds can germinate rapidly (4–10 days) when sown in favorable conditions, which include warm temperatures and abundant light. The germination rates of freshly collected seeds that were sown in good light ranged from 35–100%, while seeds sown in the dark were slower to develop and less than 10% sprouted (Salisbury 1970). Salisbury observed that the young seedlings developed skirt-like structures composed of numerous (50+) hairlike roots that anchored the plants in wet, muddy substrate and provided stability as they grew. Many species of *Veronica* are known to form mycorrhizae (Wang and Qiu 2006), although no specific reports of fungal associates were found for *V. catenata*.

*V. catenata* seeds that do not germinate quickly can persist for years in the soil. Hölzel and Otte (2001) found *V. catenata* in the seed banks of meadows that had been subjected to lengthy periods of flooding, noting that the species was also present in the vegetation, and Bissels et al. (2005) indicated that *V. catenata* was abundant in the seed bank. Stroh et al. (2012) examined the seed banks of restored agricultural lands in three age categories (5, 15, and 60 years). *Veronica catenata* was present in the vegetation only at the 60-year-old site but the species was documented in the seed banks at all three locations.

### **Habitat**

*Veronica catenata* grows in a variety of wet places at elevations of 0–2,500 meters. Typical habitats have been described as stream channels and banks, marshes and marsh fringes, beaver-impounded wetlands, lake shores, ditches, sloughs, and other muddy places (Jones and Bell 1974, Macdonald 2003, Kleijn and Langevelde 2006, Albach 2020, Weakley 2022).

Sessile Water-speedwell is often associated with limestone. In New Jersey it inhabits calcareous fens (Johnson and Walz 2013). A population observed by Snyder (1989) was locally abundant in a spring-fed brook that meandered through a limestone fen, where it could be found growing in full sun or semi-shade along with *Potamogeton foliosis* and *Nasturtium officinale*. Pennell (1932) described its Pennsylvania habitats as stream-courses over limestone. At several locations in Europe *V. catenata* has been found in low-fertility fens and other sites with limestone substrates (Bissels et al. 2005, Stroh et al. 2012, Demars et al. 2014).

*Veronica catenata* can also grow on intermittently flooded sites, and in those places it is likely to be functionally annual or short-lived (Salisbury 1970). At a number of locations the substrates on which *V. catenata* was found were typically inundated during the winter and spring but dried out in the summer (Sýkora 1982, Callaghan 1998, Bissels et al. 2005). Schwab et al. (2018) simply noted that the species occurred in habitats with fluctuating water levels.

Although Albach (2020) observed that *Veronica catenata* rarely occurs in running water, Fortner and White (1988) provided some details about a population that was found in a stream where the mean surface water velocity was 22 cm/s<sup>-1</sup>. *V. catenata* was most abundant in parts of the waterway where surface water mixed with groundwater. The plants were rooted in firm, coarse sands mixed with gravel and often co-occurred with *Sparganium chlorocarpum* near the stream margins just beyond the most rapidly flowing waters.

### **Wetland Indicator Status**

*Veronica catenata* does not appear on the National Wetlands Plant List. It is likely included under *V. anagallis-aquatica*, as it is by the USDA (see below). *Veronica anagallis-aquatica* 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 2023)**

VECA7 is the code for *Veronica catenata*, the New Jersey accepted name. The USDA does not distinguish *V. catenata* from *V. anagallis-aquatica* and lists it as a synonym under the code VEAN2.

### **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 *Veronica catenata* includes much of the United States, southern Canada, Europe, and northern Africa (POWO 2023). The map in Figure 1 depicts the extent of *V. catenata* in the United States. Albach (2020) also noted unconfirmed reports of the species for Connecticut and Alaska. There is some uncertainty regarding the southern limits of *V. catenata* due to " taxonomic confusion, misidentifications, and misattributions" (Weakley et al. 2022).

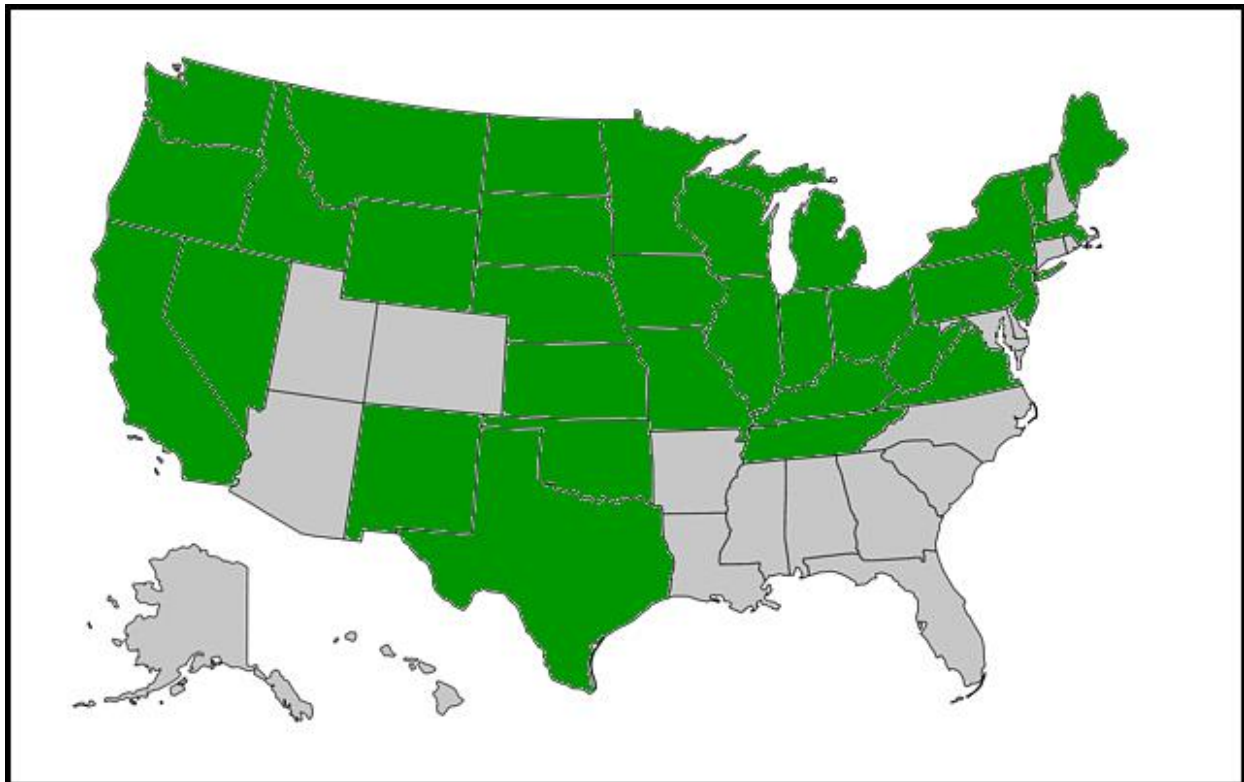


Figure 1. Distribution of *V. catenata* in the United States (source data from POWO 2023, NJNHP 2022).

*Veronica catenata* has only been reported from one New Jersey county: Warren County (Figure 2). The records include both historic and current observations.

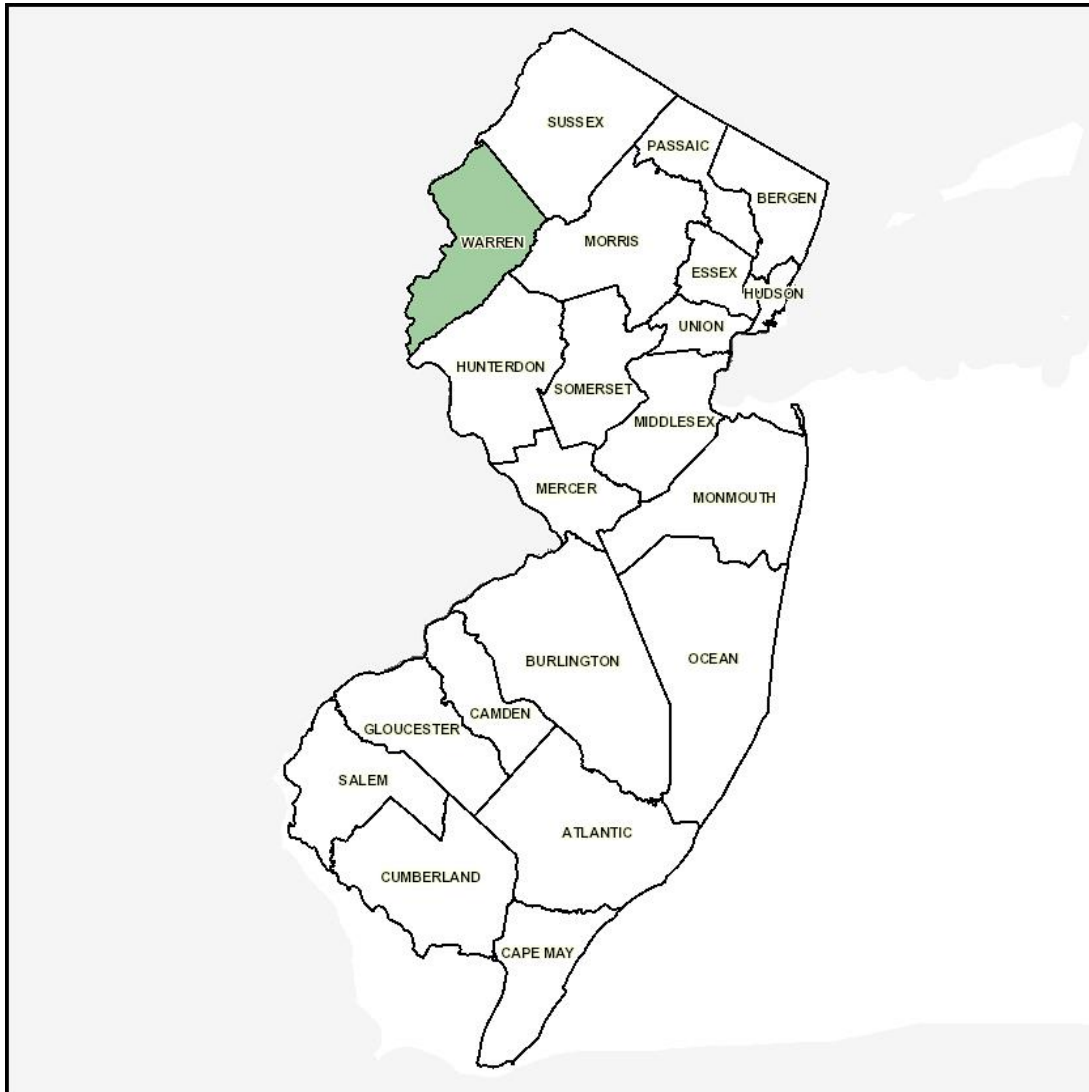


Figure 2. County records of *V. catenata* in New Jersey and vicinity (source data from NJNHP 2022).

### **Conservation Status**

*Veronica catenata* is considered globally secure. The G5 rank means the species has a very low risk of extinction or collapse due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats (NatureServe 2023). The map below (Figure 3) illustrates the conservation status of *V. catenata* throughout North America. The species is critically imperiled (very high risk of extinction) in five states and one province, imperiled (high risk of extinction) in two states and one province, and vulnerable (moderate risk of extinction) in one state and two provinces. In other parts of its reported range it is unranked or unconfirmed.

In North America, *Veronica catenata* 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 R1 (critically imperiled), signifying a very high risk of extinction (Frances 2017).

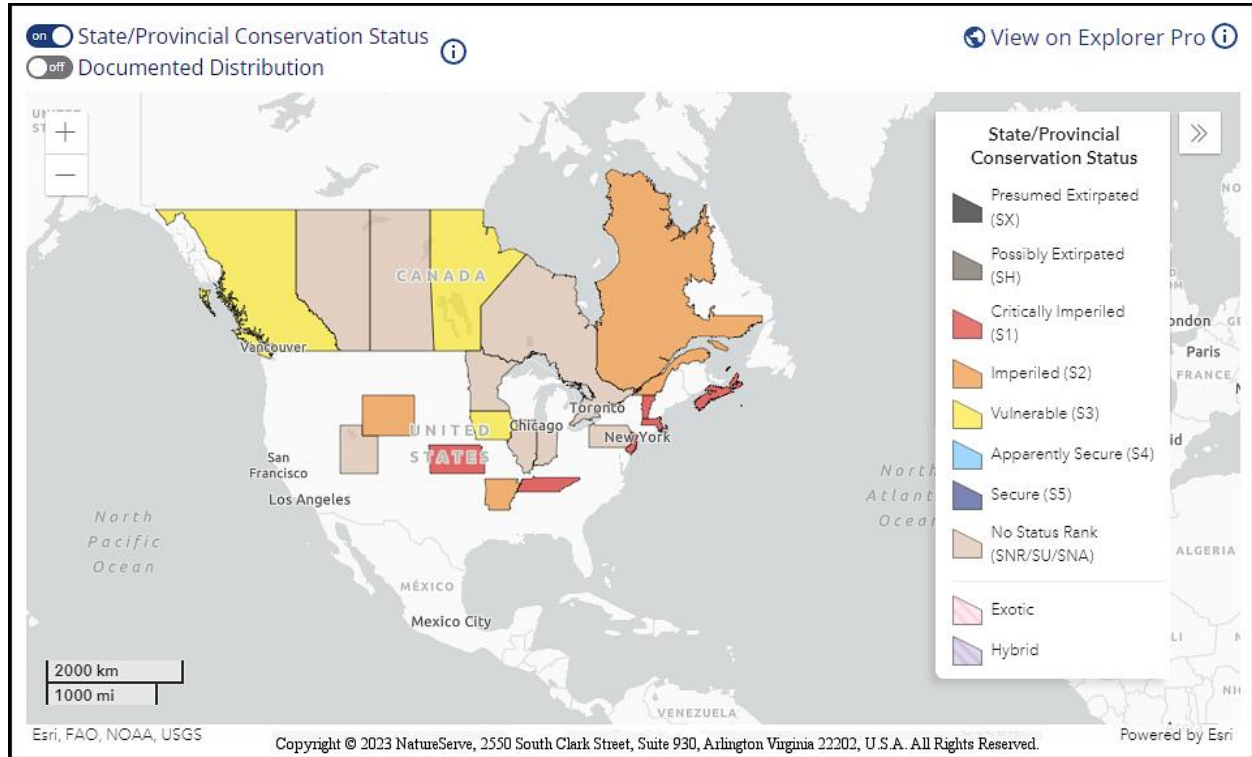


Figure 3. Conservation status of *V. catenata* in North America (NatureServe 2023).

New Jersey is one of the states where *Veronica catenata* is critically imperiled (NJNHP 2022). 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. Sessile Water-speedwell 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 *V. catenata* 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).

*Veronica catenata* is only currently known to be extant at one site in New Jersey. Several plant specimens subsequently identified as *V. catenata* were collected at another site in 1907, but the species was not documented in the state again until 1988 when a new population was found by Snyder (1989). Although both occurrences were located within the same county they were situated in two separate watersheds (NJNHP 2022).



## **Threats**

*Veronica catenata* was recently reported as a host plant for a gall-forming fungus in Britain (Preece 2002). *Sorosphaera veronicae* (synonym *Sorosphaerula veronicae*) has been found at scattered locations around the globe, including the northeastern United States (GBIF 2023). The fungus causes the formation of galls on various aboveground parts of *Veronica* plants, and stem galls can stunt the development of nearby leaves. However, after studying the development of the fungus on *Veronica chamaedrys*, Blomfield and Schwartz (1910) concluded that the effects were largely local and overall damage to host plants was relatively minor.

Invasive plants have been noted as a threat to New Jersey's only extant occurrence of *Veronica catenata*, although no particular species was named (NJNHP 2022). However, Watercress (*Nasturtium officinale*) was previously observed at the site by Snyder (1989). *Nasturtium officinale* is a Category 2 invasive species in New Jersey. Plants in that category are not widespread throughout the state but can become abundant in certain communities (VanClef 2009). Calcareous fens are a habitat where *N. officinale* can be problematic, often forming dense, monospecific patches to the detriment of native species. Another exotic plant known to develop monospecific stands in northern New Jersey's fens is Common Reed (*Phragmites australis* ssp. *australis*). Both of the invasive species are considered highly threatening to native communities in the state (FoHVOS 2022).

The calcareous fen communities favored by *Veronica catenata* in New Jersey face additional pressures including altered hydrology, degraded water quality, and vegetative succession, and they are also highly vulnerable to climate change (Johnson and Walz 2013). However, an assessment by Ring et al. (2013) concluded that the characteristics of *Veronica catenata* do not make the species itself particularly vulnerable to climate change. *V. catenata* was ranked as Presumed Stable, indicating that available evidence did not project a substantial change in its abundance and/or range extent within the state by 2050 although some range shifts might occur. Although multiple dispersal mechanisms can be utilized by Sessile Water-speedwell, a lack of connectivity between habitats utilized by the species could hamper its ability to colonize new locations when established sites become less suitable.

## **Management Summary and Recommendations**

More information is needed regarding the invasive plant species that co-occurs with *Veronica catenata* in New Jersey and the extent of the threat to the rare speedwell. The development of a site-specific management plan is recommended for the state's only known population of *V. catenata*.

Comprehensive understanding of *Veronica catenata* is hampered by the plant's long history of entanglement and confusion with *V. anagallis-aquatica* as well as several other previously described species and subtaxons with overlapping characteristics that have since been discarded (Fernald 1939, Burnett 1950, Lawalrée 1953, Ellmouni et al. 2018). While *V. anagallis-aquatica* is generally viewed as an introduced species on the American continents, the question of whether the widespread plant is native in North America has not been fully resolved (Albach 2020) and—

as previously noted—the range boundaries of *V. catenata* in the United States are also unclear (Weakley et al. 2022). The morphological similarities between *Veronica catenata* and *V. anagallis-aquatica*, along with their capacity to hybridize and the tendency of some sources to treat them as a single species (see below), further complicate the situation and underscore the need for clarity regarding the actual extent and vulnerability of *V. catenata*.

Unlike *Veronica anagallis-aquatica*, *V. catenata* does not occur in the southern hemisphere (POWO 2023) and studies of the latter species' climactic tolerances might shed some light on the factors that define the limits of its range. Additional research could also provide some much-needed information about *Veronica catenata* by identifying insect pollinators, documenting fungal associates, evaluating competitive ability, and determining longevity in places where it occurs as a perennial plant.

## **Synonyms**

The accepted botanical name of the species is *Veronica catenata* Pennell. Orthographic variants, synonyms, and common names are listed below (ITIS 2023, POWO 2023). Some sources (eg. Kartesz 2015, USDA NRCS 2023) do not distinguish *V. catenata* from *V. anagallis-aquatica* L.

### **Botanical Synonyms**

*Veronica catenata* ssp. *catenata*  
*Veronica catenata* ssp. *pseudocatenata* Chrtek & Osb.-Kos.  
*Veronica catenata* var. *glandulosa* (Farw.) Pennell  
*Veronica comosa* var. *glaberrima* (Pennell) B. Boivin  
*Veronica comosa* var. *glandulosa* (Farw.) B. Boivin  
*Veronica connata* Raf.  
*Veronica connata* ssp. *glaberrima* Pennell  
*Veronica connata* var. *glaberrima* (Pennell) Fernald  
*Veronica connata* var. *typica* Pennell

### **Common Names**

Sessile Water-speedwell  
Chain Speedwell  
Pink Water Speedwell  
Tufted Water Speedwell

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