Viburnum lantanoides

Witch-hobble

Caprifoliaceae

Viburnum lantanoides courtesy Alan Cressler, Lady Bird Johnson Wildflower Center

***Viburnum lantanoides* 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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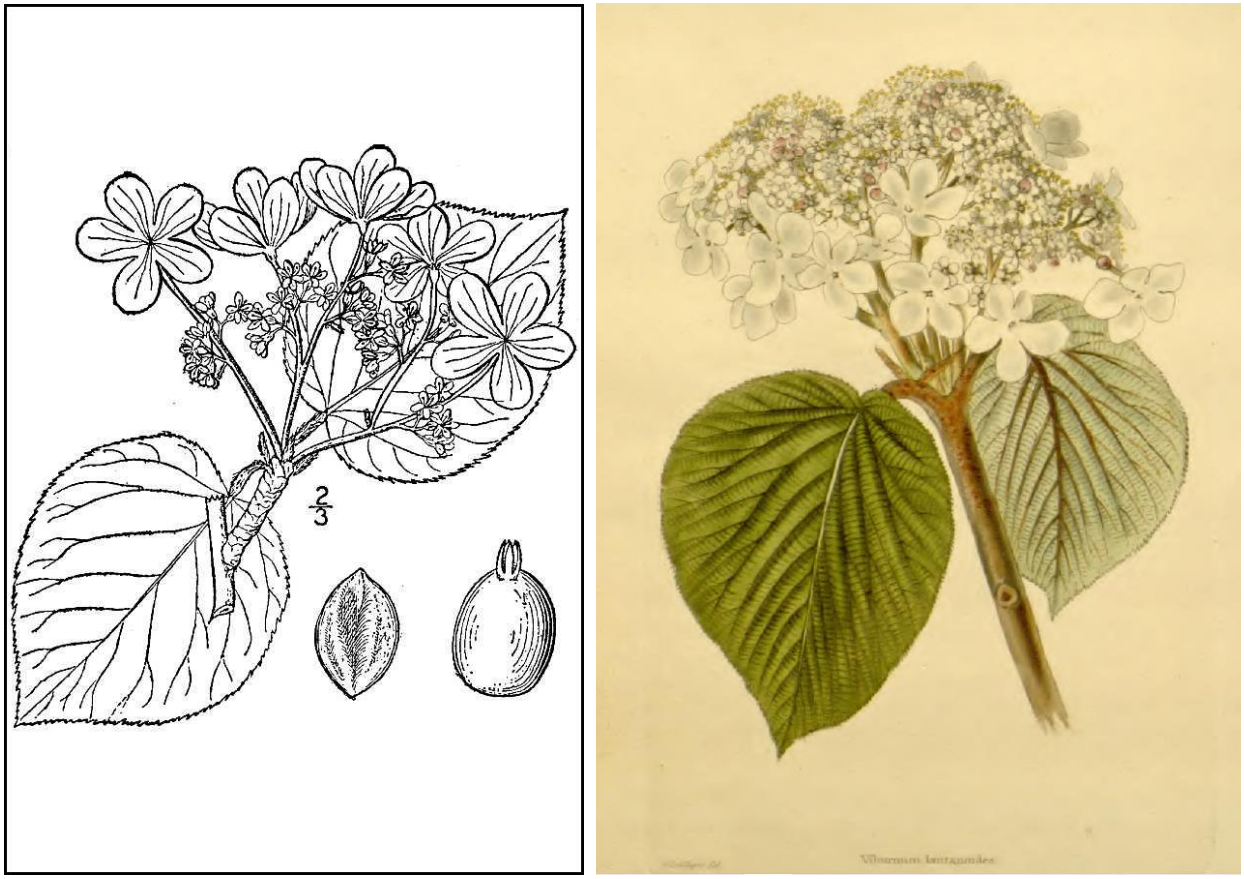
Life History

Viburnum lantanoides (Witch-hobble) is a low-growing rhizomatous shrub. The roots are shallow and grow in fibrous masses at nodes of the rhizomes (Gould 1966). Yanai et al. (2008) described the roots as "malodorous." The shrubs can spread vegetatively by low branches that root in the ground (layering), often forming foot-catching masses of vegetation that have inspired common names such as Hobblebush or Witch-hobble (Leopold 2005, Aiello and Dosmann 2019). Although the straggling or reclining growth is characteristic a more upright form can occur, and one New Jersey population consists mainly of arborescent plants (Snyder 2000). *V. lantanoides* also reproduces clonally from its rhizomes, and injuries to the stems may trigger vigorous root sprouting. Large colonies can form as a result of aggressive vegetative proliferation. Gould (1966) observed that seedlings of *V. lantanoides* were rarely encountered and suggested that the species relied heavily on clonal growth to maintain established populations.



Left: Britton and Brown 1913, courtesy USDA NRCS 2023a. Right: George Cooke, 1829.

Viburnum lantanoides shrubs seldom exceed 3 meters in height and may be slightly wider than tall (Fernald 1950, Cullina 2005). As branches develop they fork at the tips but only one of the lateral shoots continues to develop, a pattern known as sympodial growth (Keller 1898). The large, heart-shaped leaves are toothed on the edges and arranged in pairs along the stems. Aiello and Dosmann (2019) observed that leaves of *V. lantanoides* "stuck out at wide angles to catch the light." Both the leaf petioles and the bases of the flower stalks are hairy. The inflorescence

is a branching cluster of small fertile flowers surrounded by large (up to 2.5 cm wide) sterile flowers. The flowers are five-parted and white or occasionally pink. The fruits are one-seeded drupes that start out red but darken with age, eventually becoming purple-black. (See Britton and Brown 1913, Fernald 1950, Gleason and Cronquist 1991, Munroe et al. 2014).

Courtesy Thomas L. Muller 2009 (left) and Stephanie Brundage 2017 (right), Lady Bird Johnson Wildflower Center.

Late in the growing season, *Viburnum lantanoides* forms flower and leaf buds for the following year (Cullina 2005). Both types of buds are naked, meaning that they lack protective outer scales (Clement et al. 2014). The winter leaf buds are usually 10–40 mm long and have a distinctive herring-bone pattern. In the spring, twig elongation is initiated shortly before the flowers and leaves begin to expand (Gould 1966). Throughout its range, *V. lantanoides* may bloom from April through June (Hough 1983, Rhoads and Block 2007, Munroe et al. 2014, Weakley et al. 2022). Flowering on a given plant typically lasts for 7–12 days. The sterile marginal flowers usually open several days in advance of the fertile ones, and individual flowers remain open for 4–5 days before the corollas wither and fall off (Gould 1966, Donoghue 1980). Fruit set is evident shortly after blooming ends (Gould 1966) but maturation is delayed for several months (Stiles 1980). Gallinat et al. (2018) reported a mean fruiting date of August 22 based on observations of 69 herbarium specimens collected in New England. As the fruits develop the colors change so during early September green, red, and black fruits can be seen simultaneously. When the fruits are red the seeds may be sufficiently mature for germination although success rates are higher in seeds from completely ripened drupes (Gould 1966). The leaves of *V. lantanoides* display a wide array of fall colors that may include lime green, burgundy, red, pink, purple, and gold tones (Ruchala 2000, Cullina 2005).

Viburnum used to be included in the Caprifoliaceae but has recently been transferred to the Adoxaceae (APG III 2009). The large genus has been subdivided and *V. lantanoides* is the only North American species in section *Pseudotinus*. The other three species in the section (*V. furcatum*, *V. sympodiale*, and *V. nervosum*) are native to eastern Asia. Members of section *Pseudotinus* share morphological similarities ranging from growth structure to endosperm development. Molecular data indicates that *V. lantanoides* is most closely related to *V. furcatum*, and the two species also occur in comparable habitats and communities on opposite sides of the globe (Ferguson 1966, Winkworth and Donoghue 2005, Aiello and Dosmann 2019).

Pollinator Dynamics

The fertile flowers of *Viburnum lantanoides* emit a faintly sweet odor and produce small amounts of nectar. They are visited by an assortment of insects including bees, wasps, ants, flies, butterflies, moths, and beetles as well as by Ruby-throated Hummingbirds (*Archilochus colubris*). The most frequent visitors, and likely the most important pollinators, are andrenid bees that use the flowers as a source of pollen (Gould 1966, Donoghue 1980, Park et al. 2019).

The showy sterile flowers at the perimeter of each inflorescence do not produce nectar but appear to serve as visual cues that draw insects closer to patches of plants. Experimental work by Park et al. (2019) demonstrated that the presence of the large marginal flowers doubled the number of insect visits and significantly increased fruit set. During the spring when *V. lantanoides* is in bloom relatively few pollinators are active and their availability can fluctuate according to weather conditions, so the conspicuous outer flowers help the plants to attract a greater number of insects (Park et al. 2019, Park and Donoghue 2021).

Viburnum lantanoides is primarily dependent on cross-fertilization to produce viable seeds. The flowers apparently begin releasing pollen before the stigmas become receptive, limiting the opportunities for self-pollination (Donoghue 1980). *V. lantanoides* flowers that were experimentally self-pollinated produced very little fruit in comparison with blooms that were cross-pollinated by hand or naturally pollinated by insects (Park et al. 2019).

Seed Dispersal and Establishment

Dispersal of *Viburnum lantanoides* fruits typically begins during August and continues into the fall. Many of the fruits drop to the ground as they ripen but some may remain attached well into the winter (Stiles 1980). Chipmunks, mice, and other small mammals collect the fallen fruits, often caching them early in the fall but consuming them on the spot later in the season (Gould 1966). Other mammals that are known to eat *Viburnum* fruits—including bears, raccoons, foxes, fishers, and skunks—may also serve as potential dispersers (Willson 1993). Stiles (1980) classified *Viburnum* drupes as fall low-quality fruits: They are likely to be passed over by migrating birds that favor fruits with higher sugar and fat content, but can remain on the shrubs longer without rotting and thus help to sustain winter residents. Resident birds generally disperse seeds over a relatively small area.

Viburnum lantanoides seeds do not germinate rapidly because they require a period of warm stratification followed by a period of cold stratification in order to sprout (Gould 1966, Leopold 2005). The seeds may persist in the soil for some time before they develop: Smallidge and Leopold (1995) found that *V. lantanoides* was present in the seed banks of deciduous forest communities. Seedlings of the species develop slowly, initially producing a simple, shallow root system and a single stem that does not begin to branch until after the fifth year (Gould 1966). *Viburnum lantanoides* is known to form associations with arbuscular mycorrhizal fungi (Jevon et al. 2022), although it is not clear whether fungal relationships are necessary for the successful establishment of young plants.

Habitat

Viburnum lantanoides has a strong affinity for montane upland forests (Fridley et al. 2007). Populations in the southern Appalachian mountains usually occur at 1000+ meters above sea level (Naczi et al. 2002, Weakley et al. 2022). In western Pennsylvania, Porter (1899) identified *V. lantanoides* as a characteristic species of the Pocono Plateau, where elevations range from 600–700 meters. Typical habitats include cool moist woods, ravines, and boulder fields with a canopy of either evergreen or deciduous species (Ferguson 1966, Fairbrothers and Hough 1973, Rhoads and Block 2007, Munroe et al. 2014, Weakley et al. 2022).

Breden et al. (2001) cited *Viburnum lantanoides* as a characteristic understory shrub of Northern Hardwood Forest associations where *Acer saccharum*, *Betula allegheniensis*, and *Fagus grandifolia* are the primary canopy trees. The community type is widespread in New England but rare (S1S3) in New Jersey. Other forest communities where *V. lantanoides* may occur include the *Acer saccharum—Fraxinus* spp.*—Tilia americana* association and the *Tsuga canadensis—Betula allegheniensis—Prunus serotina / Rhododendron maximum* association, both of which are also rare in the state (Breden et al. 2001). One of New Jersey's extant populations of *V. lantanoides* is located in a mixed hardwood-conifer forest and another is in a *Tsuga canadensis* ravine. *T. canadensis* was also noted as the characteristic canopy tree associated with two of the state's historical Witch-hobble occurrences (NJNHP 2022).

In the Catskill Mountains, Harshberger (1905) reported *Viburnum lantanoides* as a typical understory species both in deciduous forests dominated by *Fagus americana*, *Castanea dentata*, and *Quercus rubra* and in higher elevation evergreen forests dominated by *Abies balsamea*. In the Great Smoky Mountains, Witch-hobble was identified as a prevalent species in the shrub layer beneath a canopy of *Picea rubens*, *Abies fraseri*, and *Betula allegheniensis* (Carroll 1943). *B. allegheniensis* and *Magnolia fraseri* were noted as the characteristic trees associated with a *V. lantanoides* population in the Cumberland Mountains of Kentucky (Naczi et al. 2002). A Quebec evaluation of small wetlands in an upland forest matrix described five communities in terms of the plants that were most strongly identified with each: *V. lantanoides* was an indicator species of *Deparia acrostichoides* type, had a strong presence in *Osmunda cinnamomea* and *Glyceria striata* types, and occasionally occurred in *Matteuccia struthiopteris* and *Osmunda regalis* types (Flinn et al. 2008). In the Adirondack region, *V. lantanoides* was recorded as a dominant species in the understory of a deciduous forest that had established on a former open-pit iron and titanium mining site (Meyer 2009).

Gould (1966) studied seedling establishment in *Viburnum lantanoides*, examining both substrate characteristics and light levels. Hardwood mor, a somewhat acidic soil often found in cool, high-altitude sites, supported significantly greater numbers of seedlings than other soil types tested (mineral soil, hardwood mull, and spruce-fir substrate). The seedlings were tallest when grown in full sun but survival rates were enhanced in shaded conditions, possibly due to greater moisture availability. Further investigations by Gould (1966), and more recently by Lubell and Gardner (2017), found that established *V. lantanoides* plants perform best in moderate shade, producing larger, more numerous, and healthier-looking leaves. Both studies noted that photosynthetic activity was higher in partial shade than in full sun. Lubell and Gardner (2017)

reported that shade levels of 40–70% were optimal, and observed that *V. lantanoides* plants were also likely to benefit from lower soil temperatures in shaded areas.

Wetland Indicator Status

The U. S. Army Corps of Engineers divided the country into a number of regions for use with the National Wetlands Plant List and portions of New Jersey fall into three different regions (Figure 1). *Viburnum lantanoides* has more than one wetland indicator status within the state. In the Atlantic and Gulf Coastal Plain region, *V. lantanoides* is facultative, meaning that it occurs in both wetlands and nonwetlands. In other parts of New Jersey it is a facultative upland species, meaning that it usually occurs in nonwetlands but may occur in wetlands (U. S. Army Corps of Engineers 2020).

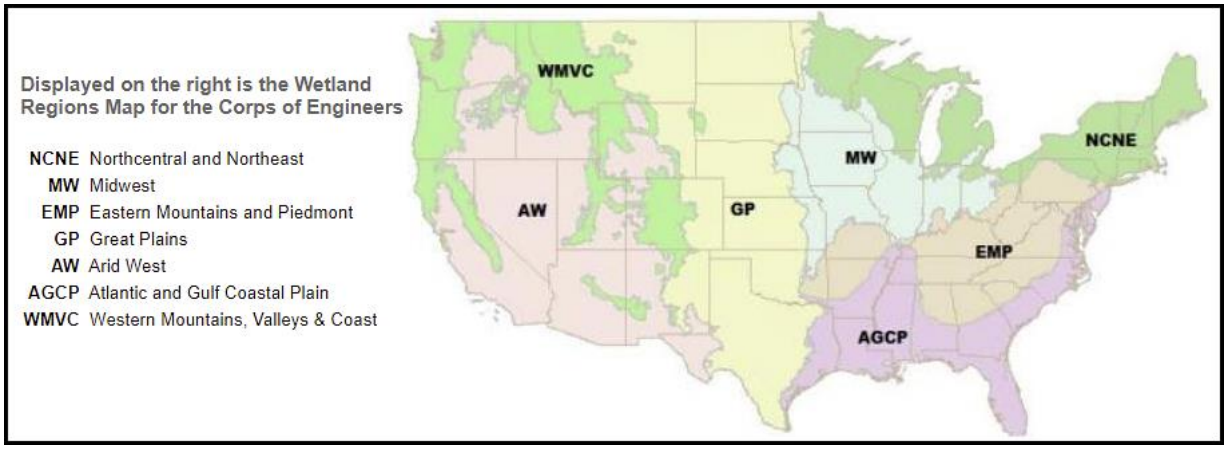


Figure 1. Mainland U. S. wetland regions, adapted from U. S. Army Corps of Engineers (2020).

USDA Plants Code (USDA, NRCS 2023b)

VILA11

Coefficient of Conservancy (Walz et al. 2020)

CoC = 9. 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 extant of *Viburnum lantanoides* is restricted to the eastern United States and Canada (POWO 2023). The map in Figure 2 depicts the range of the species in North America. Park and Donoghue (2019) believe that *V. lantanoides* persisted somewhere south of the last glacier's reach and subsequently dispersed northward along the Appalachian mountain range.

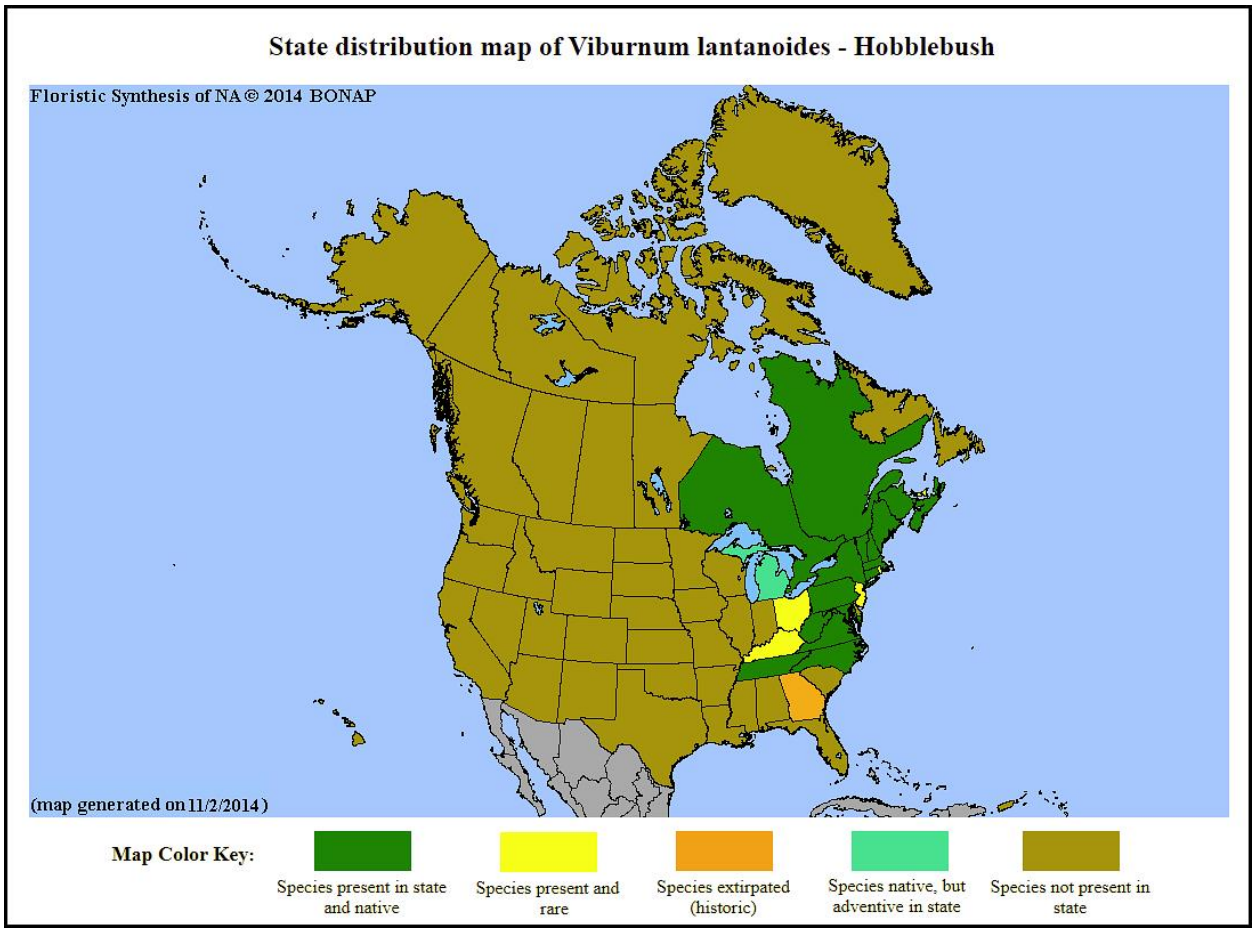


Figure 2. Distribution of V. lantanoides in North America, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2023b) shows records of *Viburnum lantanoides* in two New Jersey counties: Passaic and Sussex (Figure 3 below). The map reflects the current known distribution of the species. An additional record has been reported from Somerset County (Mid-Atlantic Herbaria 2023).

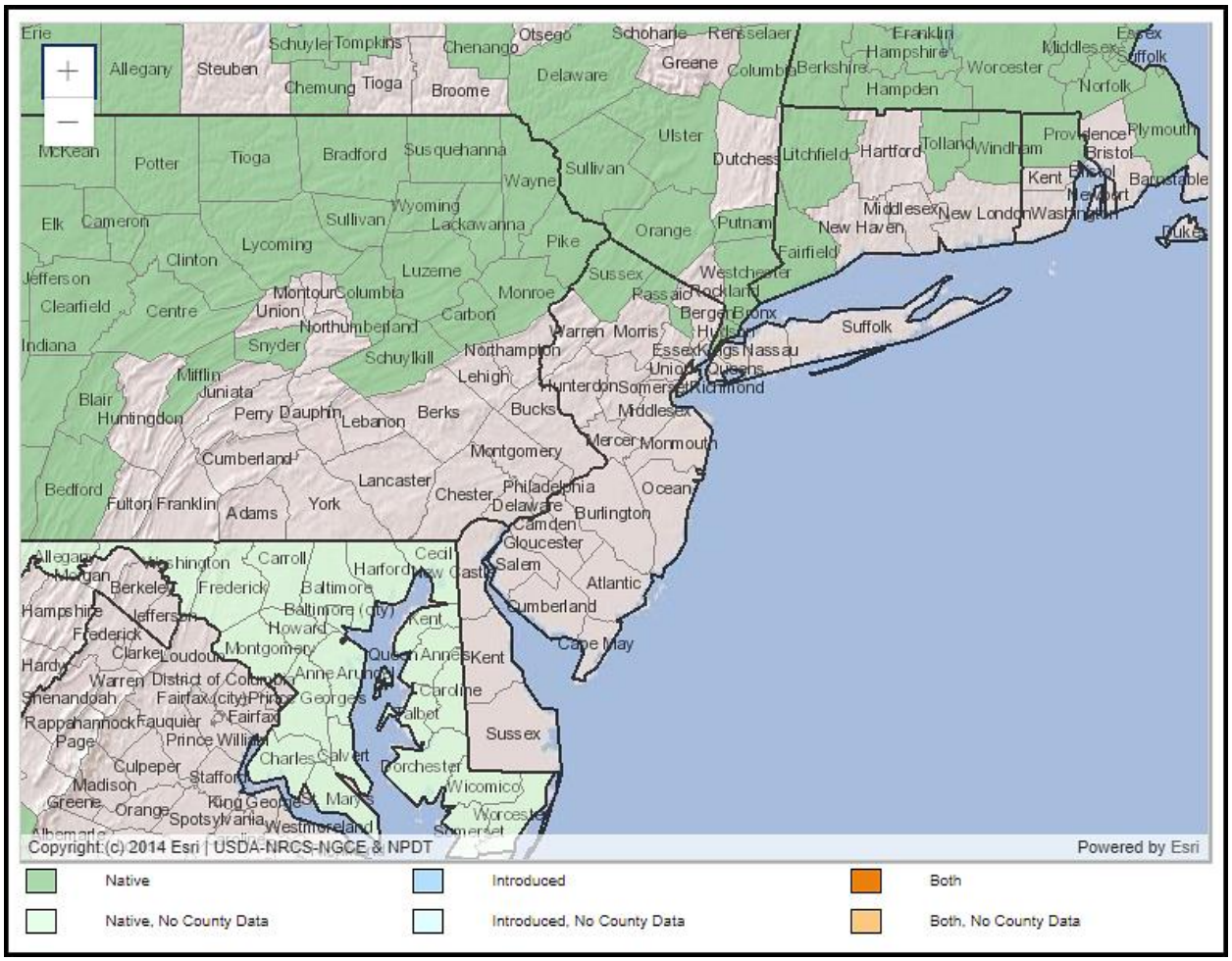


Figure 3. County records of V. lantanoides in New Jersey and vicinity (USDA NRCS 2023b).

Conservation Status

Viburnum lantanoides 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 4) illustrates the conservation status of *V. lantanoides* throughout its range. Witch-hobble is critically imperiled (very high risk of extinction) in two states and one province, imperiled (high risk of extinction) in one state, and possibly extirpated in Georgia. In other districts where the species occurs it is secure, apparently secure, or unranked.

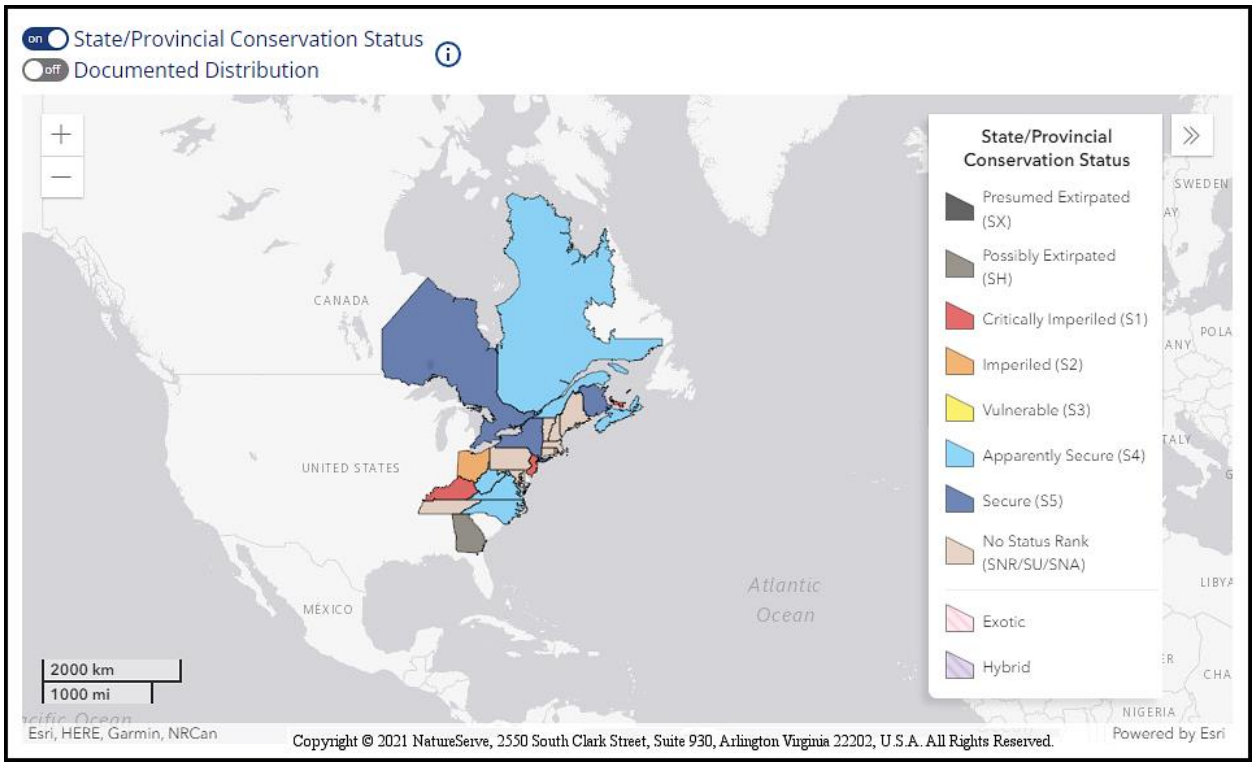


Figure 4. Conservation status of V. lantanoides in North America (NatureServe 2023).

New Jersey is one of the states where *Viburnum lantanoides* 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. *V. lantanoides* 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 being listed does not currently provide broad statewide protection for plants. Additional regional status codes assigned to the shrub 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).

The first record of *Viburnum lantanoides* in New Jersey was located in Passaic County (Taylor 1915), and that is one of the three occurrences documented between 1914–1934 which are now considered historical (NJNHP 2022). According to Hough (1983), *V. lantanoides* was only known from one site in Sussex County during the mid-1900s. The population was initially discovered in 1956 and subsequently relocated in 1981 (Snyder 2000), remaining the sole known New Jersey occurrence through the turn of the century (Breden et al. 2006). During 2004 a small colony was found in Passaic County, and those two populations are presently thought to be the only extant occurrences in the state (NJNHP 2022).

Threats

No threats have been reported to New Jersey's extant occurrences of *Viburnum lantanoides*, although both colonies are small and updated status information is needed (NJNHP 2022). Some populations at other locations could be affected by habitat destruction. In Kentucky, another state where Witch-hobble is critically imperiled, a an occurrence was noted to be facing a potential threat from a proposed strip mining project (Naczi et al. 2002). Gould (1966) observed that assessments of logging impacts on the species differed, and although his studies found the shrub to be less abundant at logged sites he acknowledged that the detrimental effects of the harvest may have been amplified by deer browse.

Overpopulation of White-tailed Deer (*Odocoileus virginianus*) poses a significant threat to *Viburnum lantanoides*. A vegetation study in western Pennsylvania found that excessive browsing by deer had nearly eradicated the shrub from a location where it was formerly dominant (Hough 1965) and a subsequent survey of the same site reported that the understory was dominated by ferns and beech saplings (Augustine and de Calesta 2003). An overall declining trend in Pennsylvania is attributable to overbrowsing by deer (Rhoads and Block 2007). A three-site study of Witch-hobble in upstate New York documented browsing losses ranging from 49.1–72.4% of living twigs and 42.1–53.3% of current annual growth (Gould 1966). Gould noted that *V. lantanoide*s was a staple winter food source for deer in the region, but initially thought that snow cover could help to protect lower stems from browsing. However, he observed that the shrubs were often browsed during the growing season and subsequently found that 43.3% of annual herbivory damage occurred during that period, particularly early in the spring when twigs were tender. Fewer flower buds were found in areas with large deer populations, and twig dieback from repeated browsing resulted in stunted stem growth. Edge et al. (2021) reported that new shoots, buds, and leaves of *V. lantanoides* located 0.5–1.0 meter above the ground were preferentially browsed by deer.

A review of threats to *Viburnum lantanoides* from disease and insects indicated that several types of fungi were known to establish on the shrub's leaves, twigs, or branches but caused little harm, and that insect damage to foliage was also limited (Gould 1966). There is one non-native leaf beetle, *Pyrrhalta viburni*, that selectively attacks *Viburnum* species. Both larval and adult beetles feed on the leaves, and heavy infestations that result in defoliation for several consecutive years can kill the shrubs (Gyeltshen and Hodges 2016). The insect was initially introduced in Ontario but rapidly spread southward, and although studies suggested that its southern range expansion could be limited by mild winters it is already present in New Jersey (BugGuide 2023). Fortunately, *V. lantanoides* appears to be relatively resistant to the pest (Weston 2004).

In New Jersey, the vulnerability of *Viburnum lantanoides* is likely to increase as the global climate continues to change. Temperatures in the state are rising faster than they are in other parts of the northeast and shifting precipitation patterns are resulting in more frequent and prolonged droughts (Hill et al. 2020). Temperature and moisture availability appear to provide important cues that trigger blooming, so flower and leaf buds can expand in response to an unusually early warm spell and then be destroyed by a subsequent freeze (Gould 1966, Donoghue 1980). Unseasonably warm weather during April 2017 prompted flowering in a Massachusetts Witch-hobble population that normally bloomed in May (Park et al. 2019).

Precocious flowering could reduce the likelihood of cross-fertilization if the emergence time of pollinators is not similarly adjusted in response to temperature. Cullina (2005) warned would-be growers that *V. lantanoides* is intolerant of sustained summer heat, and Gould (1966) reported that high soil temperatures can injure or kill young plants. Pucko et al. (2011) assessed montane plants and communities for elevation shifts in response to climate warming but no change in the distribution of *V. lantanoides* was evident. However, the researchers noted that it was difficult to determine whether any observed movements were directly related to climate change because the effects could not be separated from those of other factors (eg. invasive earthworms at low elevations or prolonged exposure to acid deposition at high elevations) which were also likely to influence the extent or absence of range shifts.

Management Summary and Recommendations

Updated assessments are recommended for the two *Viburnum lantanoides* occurrences that are considered extant in New Jersey. Because browsing poses a significant threat to Witch-hobble and deer overabundance has been well-documented in the state, particular efforts should be made to determine if the populations have been affected and whether additional protection for the rare species is necessary and/or feasible at the sites.

Viburnum lantanoides has been identified as a native plant that could have considerable horticultural value but it has a reputation for being difficult to propagate (Lubell and Gardner 2017, Aiello and Dosmann 2019). Recently researchers have reported moderate success using stem cuttings and rooting hormones (Lubell and Gardner 2017, Ruchala 2000). A greater understanding of the relationships between *V. lantanoides* and the plants and fungi with which the species co-occurs would be beneficial. Some of the latest studies that included Witch-hobble have touched on the subject, exploring topics like competition (Bilodeau-Gaulthier et al. 2020) and mycorrhizae (Jevon et al. 2022). However the investigations were mainly focused on trees and yielded little detailed information about how the associations may harm or benefit *V. lantanoides*.

Synonyms

The accepted botanical name of the species is *Viburnum lantanoides* Michx. Orthographic variants, synonyms, and common names are listed below (ITIS 2021, POWO 2023, USDA NRCS 2023b).

Botanical Synonyms	**Common Names**
Viburnum alnifolium Marsh.	Witch-hobble
Viburnum alnifolium var. *praecox* (Kache) Rehder	Hobblebush
Viburnum alnifolium f. *praecox* (Kache) Hesse	Alderleaf Viburnum
Viburnum alnifolium f. *roseum* House	Tangle-legs
Viburnum grandifolium Aiton	
Viburnum lantana var. *canadensis* Pers.	

Viburnum lantana var. *grandifolium* Aiton
Viburnum lantanoides f. *praecox* (Kache) Rehder
Viburnum lantanoides praecox Kache

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