

Desmodium sessilifolium

Sessile-leaf Tick-trefoil

Fabaceae



Desmodium sessilifolium by Jim Keesling, 2011

***Desmodium sessilifolium* 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

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

Prepared by:
Elizabeth A. Johnson
eajohnson31@gmail.com

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

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Life History

Desmodium sessilifolium (Sessile-leaf Tick-trefoil) is a member of the Pea Family (Fabaceae), named for its very short petioles (1-3 mm). The plants grow erect (.6-1.8 m tall) on pubescent stems. The leaves are tri-foliolate, entire, alternate and nearly sessile, and typically have dense hooked hairs beneath (Gleason and Cronquist 1963; LeGrand et al 2022; New England Wild Flower Society 2022; USGS 2022).

The flowers can be white to light pink or purple (Britton and Brown 1970; Gleason and Cronquist 1963) and develop on terminal racemes, with up to five flowers per raceme. Flowers are two-lipped (bilabiate) with 5 petals, and a 4-lobed calyx. This species can be differentiated from other *Desmodiums* by its very short petioles, narrow leaflets, and narrow inflorescence (Hilty 2020; LeGrand et al. 2022).

The jointed seed pods (loments) are covered with minute hairs and readily break apart into one to three or 4 individual sections. Each seed is smooth, olive brown, kidney shaped, and laterally compressed (Gibson 2022; LeGrand et al. 2022). A deeply rooted perennial herb, *Desmodium sessilifolium* blooms in July and August throughout most of its range (Gleason and Cronquist 1963; Hilty 2020; USGS 2022).



Left: Britton and Brown 1913, courtesy USDA NRCS 2022a. Center: Leaf closeup, courtesy of Dwayne Estes, 2021. Right: Seed pod, courtesy Dwayne Estes, 2021.

Pollinator Dynamics

Desmodiums are known to be insect pollinated yet pollination has been described in the literature for only a few *Desmodium* species. In these species, the structure of the flower ensures that pollinating insects come into direct contact with a “keel” of two fused petals that contain the stamens and pistil. As the keel is jostled by the foraging insect, the stamens are pushed forward, forcing pollen onto the insect (termed “explosive pollination”). Usually, each flower can only eject pollen in this way once (Eastman 2003; Stanley et al. 2016). If there has been sufficient pollination after this encounter, the color of many *Desmodium* flowers often fades, ostensibly as a signal to the other insects to select a different flower (Stanley et al. 2016; Willmer et al. 2009). Floral pollinators of *Desmodium* spp. mentioned in the literature include bumble bees (*Bombus* spp.), sweat bees (Halictidae), leaf-cutter bees (*Megachile* spp.), and long-horned bees (*Melissodes* spp.) (Hilty 2020; Michigan State University 2022; Stanley et al. 2016). Asexual reproduction has not been reported to occur.

Many species of insects feed on the leaves, seeds, or flowers of *Desmodium* spp., for example, the caterpillars of Lepidoptera such as Silver Spotted Skipper (*Epargyreus clarus*), Northern Cloudywing (*Thorybes pylades*), Eastern Tailed Blue (*Everes comyntas*), Gray Hairstreak (*Strymon melinus*), and the Cheshire Cat Moth (*Grapholita fana*) and Green Cloverworm (*Hypena scabra*). A variety of beetles and other larval insects also feed on the foliage (Hilty 2020).

Seed Dispersal

The jointed seed pods (loments) are covered with hooked hairs. Once the seeds mature, the loments readily break apart at the joint when the hooked hairs get caught on human clothing or in the fur of small mammals that might pass by. Seeds can be widely dispersed in this manner. Seeds of *Desmodium* spp. are eaten by Northern Bobwhite (*Colinus virginianus*) and Wild Turkey (*Meleagris gallopavo*) (Martin 1951), which may also contribute to some seed dispersal as those species move about.

Seed germination of *Desmodiums* used as livestock forage has been reported to improve with scarification, cold/dry stratification, and inoculation at planting time (USGS 2022). More specifically, Harper (2002) cites germination trials for *D. sessilifolium* conducted at the New England Wild Flower Society. In this study, germination rates were determined using both cold and warm stratification, and fresh and dry seed, with resulting rates ranging from 24% to 90%. Dried seeds with cold stratification exhibited the highest germination percentage.

Plants of *D. sessilifolium* are perennial with rhizomatous roots; however, there are no bulbils or bulblets present (New England Wildflower Society 2022) and they do not spread clonally.

Habitat

In New Jersey and the northeastern United States, *Desmodium sessilifolium* is typically found in open, sunny meadows and fields with dry sandy soil, such as barrens and sandplains (New England Wild Flower Society 2022; Stone 1911). These habitats can be natural or the result of anthropogenic disturbance (New England Wild Flower Society 2022). Range-wide, the species is described as found in midgrass and tallgrass prairies throughout the central and eastern US, railroad prairies, and in open woods and borders, sandy savannas and stream valleys, rocky open woodlands, limestone glades, and along roadsides (Haddock 2007; Hilty 2020; USGS 2022).

As legumes, most *Desmodium* spp. are capable of nitrogen fixation and therefore can tolerate nutrient-poor soils. Nitrogen in the atmosphere (N₂) must be converted (“fixed”) into another form before it becomes available for uptake by plant roots. Most nitrogen is fixed by soil bacteria and in most legumes, including *Desmodium* spp., these rhizobia live in root nodules in a symbiotic relationship with the plants. Each new seedling must acquire its own symbiont from the soil in which it germinates. While there do not appear to be obligate relationships between particular species of rhizobia and N-fixing plants, some rhizobial strains may be more effective than others at fixing nitrogen. In addition, rhizobia are not evenly distributed across all habitats and soils (Parker 1999; Young and Johnston 1989). Harper (2002) speculated that a decline in some northeastern legumes, including five *Desmodium* species, could be due to a change in regional symbiotic bacterial flora although there is no direct mention of such an effect on *Desmodium sessilifolium*. Apart from these bacteria/plant symbiotic relationships, there are no other symbioses such as mycorrhizal associations mentioned in the literature.

Wetland Indicator Status

Desmodium sessilifolium is not included on the National Wetlands Plant List (NWPL). Any species not on the NWPL is considered to be Upland (UPL) in all regions where it occurs. The UPL designation means that it almost never occurs in wetlands (U. S. Army Corps of Engineers 2020).

USDA Plants Code (USDA, NRCS 2022b)

DESE

Coefficient of Conservatism (Walz et al. 2018)

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 range of *Desmodium sessilifolium* is limited to North America and includes portions of the United States, Canada, and Mexico (Kartesz 2015; POWO 2022). The map in Figure 1 depicts the extent of the species in the United States and Canada.

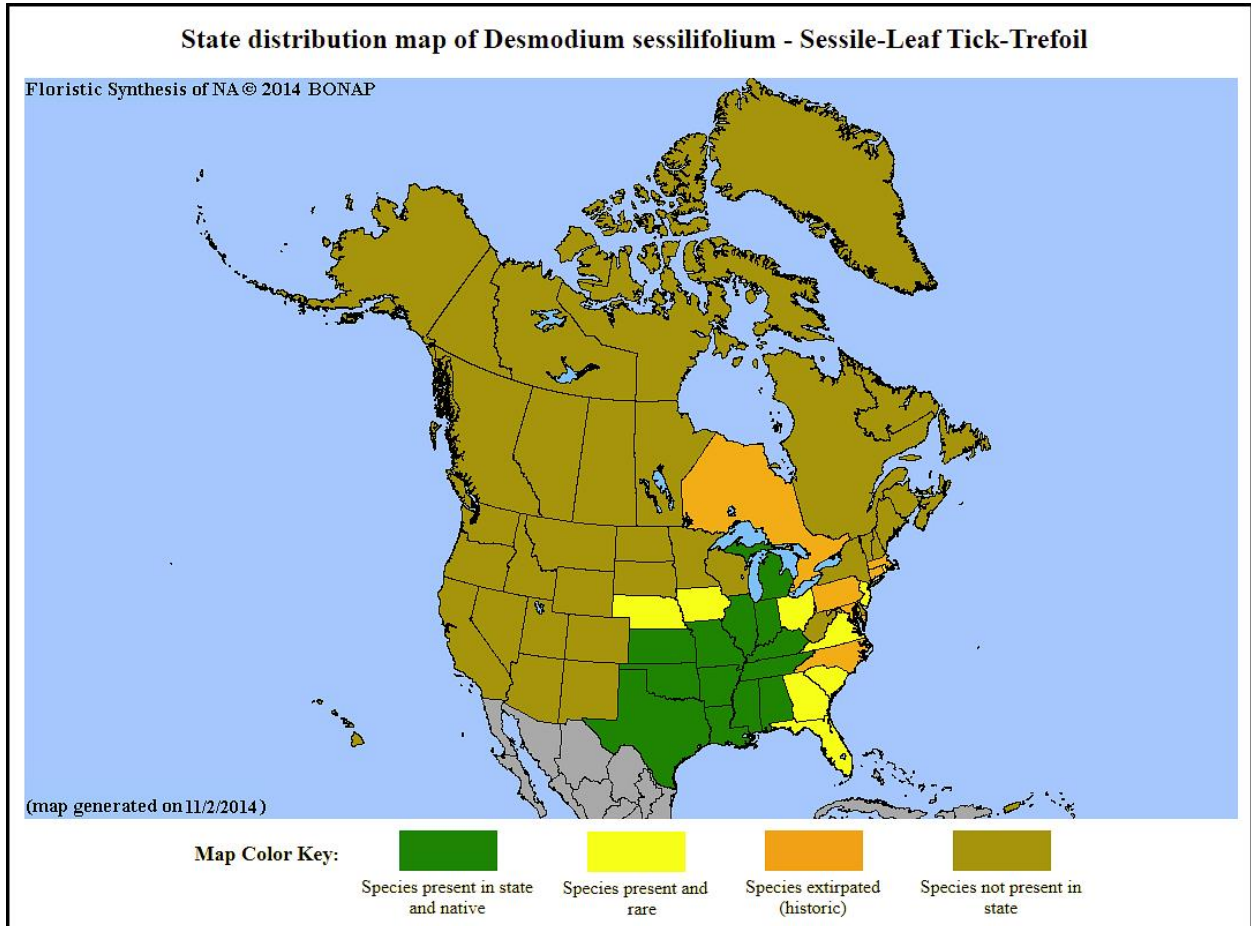


Figure 1. Distribution of *D. sessilifolium* in The United States and Canada, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2022b) shows records of *Desmodium sessilifolium* in two New Jersey counties: Atlantic and Burlington (Figure 2). The data include historic observations and do not reflect the current distribution of the species.

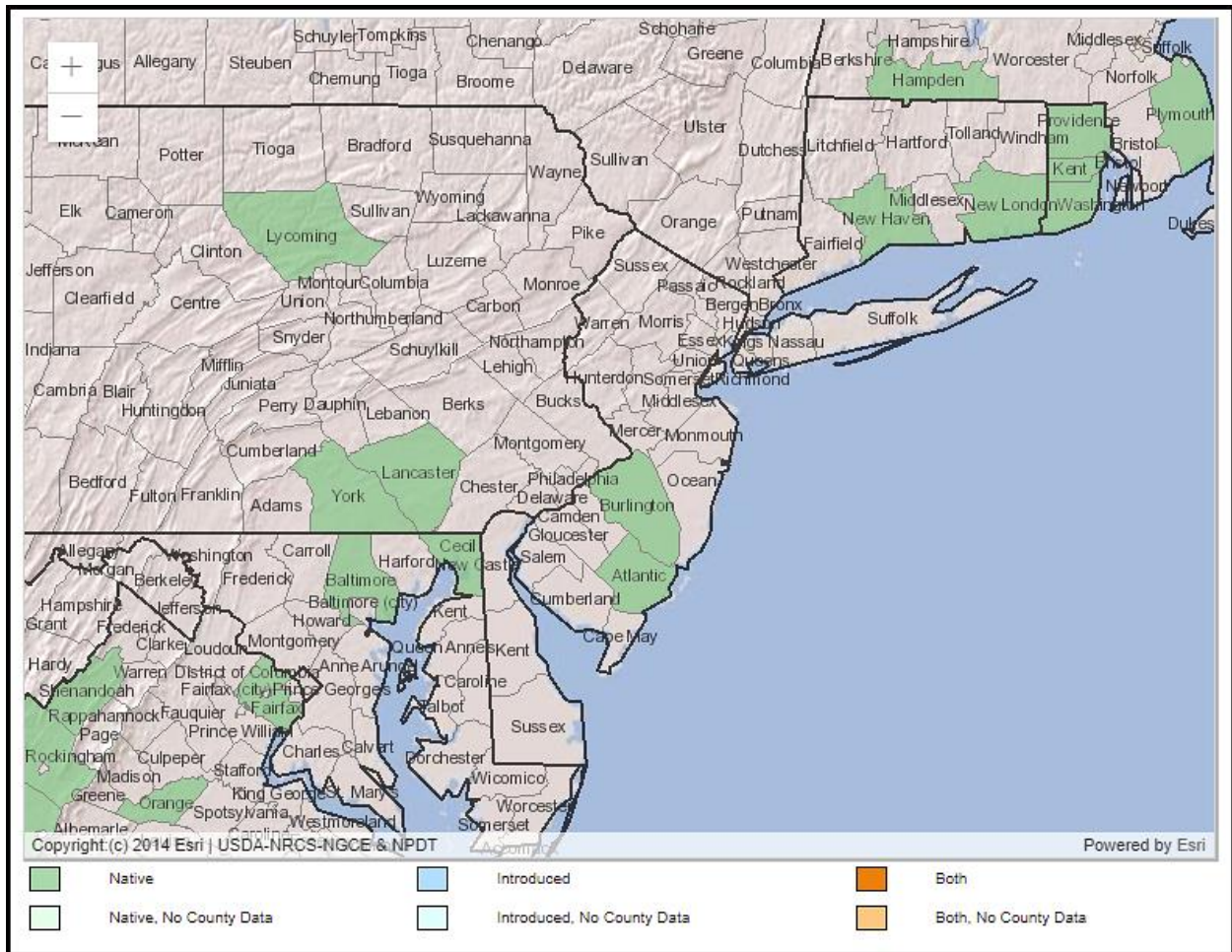


Figure 2. County records of *D. sessilifolium* in New Jersey and vicinity (USDA NRCS 2022b).

Conservation Status

Desmodium sessilifolium 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 2022). The map in Figure 3 illustrates the conservation status of Sessile-leaf Tick-trefoil in the United States and Canada. *D. sessilifolium* is critically imperiled (very high risk of extinction) in four states, imperiled (high risk of extinction) in two states, possibly extirpated in five states, and presumed extirpated in Pennsylvania and Ontario. Primarily a midwestern species, it is most imperiled at the northern and eastern limits of its range. It has not been ranked in other states where it occurs.

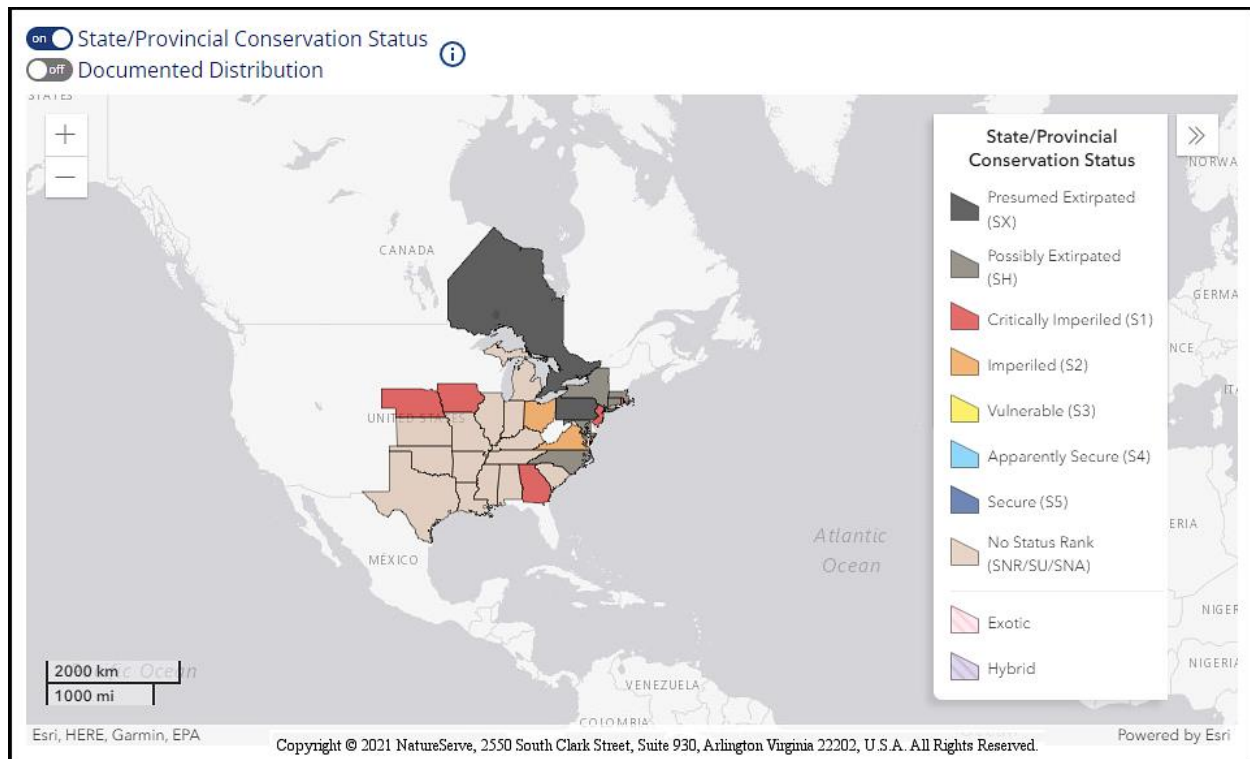


Figure 3. Conservation status of *D. sessilifolium* in North America (NatureServe 2022).

New Jersey is one of the four states where *Desmodium sessilifolium* 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. *D. sessilifolium* 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 plant 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).

Of five known occurrences in New Jersey, three are considered historical (last observed more than 50 years prior: 1903; 1921; 1945), one is considered extirpated (based on unsuitability of habitat observed during a 2008 site visit), and only one is considered viable (D—poor estimated viability due to absence of plants and observed woody succession of habitat during a 2018 site visit (NJNHP 2022). The 1903 site was found by Witmer Stone. At the time it was the only known occurrence in New Jersey reaching what Stone described as “the northern limit of the species, except the lower Susquehanna Valley in Pennsylvania” (Stone 1911).

Threats

The main threat to many peripheral populations of *D. sessilifolium* has been urban and suburban development. For example, the Vascular Plants of North Carolina website reports that “several of

the few sites where it (*D. sessilifolium*) was formerly found have now been developed, as they grew in the Charlotte metro area—a bad place to be a rare plant!” (LeGrand et al. 2022).

New Jersey occurrences have been found in waste places, along gravel roadsides, or in open sandy fields. At all known sites, the major factor contributing to the decline of the occurrence was habitat succession, with human disturbance a factor at one site where it appeared that plants had been physically removed from the location (NJNHP 2022). Breden et al. (2006) reported that most of the plant species populations lost to succession in New Jersey generally were found in the southern part of the state, typically where changes in the fire regime or hydrology have altered the conditions that prevent the growth of woody vegetation. No other specific threats to *D. sessilifolium* populations were mentioned in the New Jersey literature.

Desmodiums have been described as “palatable, nutritious, and readily eaten by all classes of livestock” (USGS 2022) such that livestock overgrazing or herbivory by white-tailed deer (*Odocoileus virginiana*) (Martin 1951) may be a potential issue in some areas. No discussion of climate change effects on this species was found in the literature.

A contributing factor in the decline of the related *Desmodium cuspidatum* has been identified as the increase in atmospheric nitrogen deposition (in the form of NO_3 and NH_4^+) especially over the northeastern United States, due to fossil fuel combustion, synthetic fertilizer production, and high-intensity agriculture (Skogen et al. 2011). Research by Skogen et al. (2011) has shown that atmospheric nitrogen deposition can put native species adapted to low-nutrient soil conditions (like the N_2 -fixing *D. cuspidatum*) at a competitive disadvantage to non- N_2 -fixing species. Non- N_2 fixers (e.g., *Solidago canadensis*) may be more efficient at exploiting this added N for growth than N_2 -fixers like *Desmodium*. It is not known whether this also has affected New Jersey *Desmodium sessilifolium* populations adapted to the sandy, nutrient-poor Pine Barrens soils.

Other potential threats have been reported for the related *D. cuspidatum* (Harper 2002) and similar issues could face *D. sessilifolium* in peripheral populations. These threats include a decrease or lack of suitable rhizobia for *Desmodium* in New Jersey habitats or a change in the local pollinator community. Additionally, while the seeds may be widely disseminated by animals, New Jersey populations are fragmented and distant from each other, which may contribute to a loss of genetic diversity.

Management Summary and Recommendations

If possible, the last remaining *Desmodium sessilifolium* population in New Jersey should be revisited, and additional adjacent habitat surveyed to confirm (or not) the presence of the species. Habitat management such as woody shrub removal to restore open, early succession conditions at the site may be warranted, with subsequent site monitoring for any regeneration that may occur. Although there is no information in the literature about seed bank longevity, as mentioned above, cold scarification has been shown to benefit germination in this species (Harper 2002). In addition, the related *D. cuspidatum* has been found to germinate best in open areas on bare soil with minimal to no leaf litter (Skogen et al. 2010).

Further research may be useful to determine whether other factors have contributed to the decline of *Desmodium sessilifolium* in New Jersey or other peripheral locations, in particular fragmentation that has led to a reduction in genetic diversity, herbivory, increased atmospheric nitrogen deposition, or alterations to rhizobial or pollinator communities.

Synonyms

The accepted botanical name of the species is *Desmodium sessilifolium* (Torr.) Torr. & A. Gray. Orthographic variants, synonyms, and common names are listed below (ITIS 2021; POWO 2022; USDA NRCS 2022b; USGS 2022).

Botanical Synonyms

Meibomia sessilifolia (Torr.) Kuntze
Hedysarum sessilifolium var. *angustifolium* Torr. ex M. A. Curtis

Common Names

Sessile-leaf Tick-trefoil
Sessile Tickclover
Sessileleaf Ticktrefoil
Sessileleaf Tickclover
No Petioled Beggar-ticks

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