Polygonum glaucum

Sea-beach Knotweed

Polygonaceae

Polygonum glaucum by Doug McGrady, 2023

***Polygonum glaucum* 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

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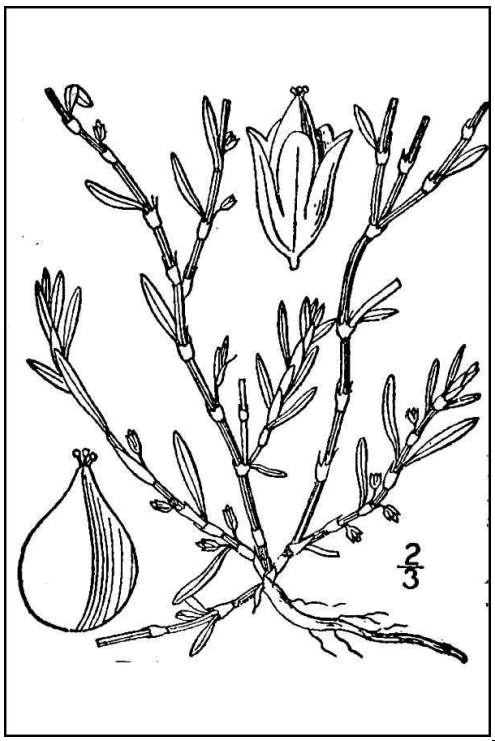
Life History

Polygonum glaucum (Sea-beach Knotweed) is an annual herb in the Buckwheat family. Plants in the Polygonaceae have swollen stem nodes and membranous sheaths (ocreae) at the base of the leaf petioles, the characteristics of which are often useful in species identification (Fassett 1957, Zomlefer 1994). Although many of the formerly recognized sections within *Polygonum* are now viewed as separate genera, two have been retained and *P. glaucum* is included in Section *Polygonum*. *Polygonum* plants are best identified when leaves, flowers, and achenes are present (Costea et al. 2020).

Polygonum glaucum is a low, sprawling plant with repeatedly branching stems that are 20–70 cm long. The ocreae are conspicuous, particularly on the lower part of the stems: They are 7–15 mm long with a waxy coating that give them a silvery appearance at the tips and their bases turn brown with age. The leaves are lanceolate to elliptic, 1–3 cm long, and 2–8 mm wide; they also have a waxy coating so the entire plant has a whitish cast. Flowers develop in small clusters in the leaf axils. Each flower has 8 whitish-yellow anthers and 5 petaloid tepals that are white or pink-margined and 3–4 mm in length. The mature achenes extend beyond the tepals and they are three-sided, red-brown to blackish, and shiny. Knotweed species in Section *Polygonum* have two types of fruits: In *P. glaucum* those that are produced in the summer are 2.5–3 mm long and those that develop in the fall are 3–5 mm in length. (See Nuttall 1818, Britton and Brown 1913, Fernald 1950, Mertens and Raven 1965, Gleason and Cronquist 1991, Tiner 2009, Costea et al. 2020). Löve and Löve (1956) determined that *P. glaucum* was a tetraploid species (2n = 40).



Left: Britton and Brown 1913, courtesy USDA NRCS 2024a. Right: Jim Natale, 2020.

Sea-beach Knotweed can generally be found in bloom and fruit from July through November, although it may begin earlier at the southern end of its range (Hough 1983, NYNHP 2011,

Costea et al. 2020, Weakley et al. 2024). Fernald (1928) characterized *Polygonum glaucum* as a species with multiple centers of abundance scattered over a wide area. Individual populations tend to be ephemeral and exhibit substantial fluctuation in size from one year to the next (Snyder 2000, Stalter and Lamont 2000, NYNHP 2011, Leeson 2019). *P. glaucum* often disappears for years from a site where it has been recorded but subsequently reestablishes in the same vicinity (Lortie et al. 1991, Backus et al. 2002, Kelly 2013).

Pollinator Dynamics

Pollination has not been studied in *Polygonum glaucum*. Bees and flies pollinate the flowers of many other species in the Polygonaceae (Zomlefer 1994), and short-tongued halictid bees have been observed visiting the flowers of a related knotweed (Hilty 2020). However, self-fertilization is prevalent in Section *Polygonum*, particularly in the species with inconspicuous flowers (Styles 1962, Costea and Tardif 2005). It is possible that *P. glaucum* utilizes a mixed mating system. Its flowers are semi-open and thus accessible to insects but the likelihood of self-pollination is supported by the frequency of selfing in related species and by the ability of *P. glaucum* to persist in tiny, widely scattered populations where the probability of cross-fertilization is low.

Seed Dispersal and Establishment

As previously noted, *Polygonum glaucum* and the other species in Section *Polygonum* produce seeds of different sizes during the summer and fall seasons and the seeds differ in their germination biology as well. The smaller seeds that develop in the summer are dormant at maturity, requiring a period of cooler winter temperatures before they can germinate, and those that do not sprout in the spring can become dormant again when temperatures rise during the summer. The larger seeds that are produced in the fall are capable of germination upon dispersal (Baskin and Baskin 1990, Costea et al. 2020).

Although no species-specific information was found regarding seed dispersal in *Polygonum glaucum*, wind is the typical distribution mechanism for the propagules of annual plant species in coastal habitats (Maun 2008). The seeds generally travel for relatively short distances from the parent plants, increasing the likelihood that they will be deposited in favorable microsites (Fahrig et al. 1993). Water probably plays an occasional role in the movement of seeds to new locations along the shoreline, and even seeds that lack buoyancy may occasionally be transported on floating pieces of vegetation or debris. Episodic long-distance dispersal can occur in conjunction with extreme meteorological events (Nathan et al. 2008). One New Jersey population of *Polygonum glaucum* appeared to have colonized a new site in the wake of a record tidal surge associated with a massive storm (Stalter and Lamont 2000). Stalter et al. (1996) attributed a rare inland occurrence of the knotweed in New York to dispersal of propagules by storm activity, and in Massachusetts seeds of *P. glaucum* have sometimes been relocated by overwash (MANHESP 2015).

Habitat

Polygonum glaucum exemplifies a species that is rare as a result of its narrow habitat requirements (Stalter and Lamont 1998). Throughout its range, *P. glaucum* can be found growing on sand, silt, pebbles or cobbles in open habitats that are less than 10 meters above sea level including coastal beaches, dune hollows, and the margins of salt ponds or marshes (Fogg 1930, Hough 1983, NYNHP 2011, Costea et al. 2020, Weakley et al. 2024).

Polygonum glaucum is a characteristic species of Maritime Beach Strand communities and it is one of the few plants capable of growing in those settings. The habitats are sparsely vegetated because they are highly stressful: The constant wave action makes the substrate unstable and the plants are frequently exposed to salt spray and occasionally inundated during exceptionally high tides (Higgins 1969, Kutcher et al. 2004, Spongberg 2008, Nordstrom and Jackson 2018). On the beach, *P. glaucum* plants may be located at or near the strand line or along the ocean-facing side of the primary dunes (Stalter et al. 1986 & 1996, Heard et al. 2012, Lamont and Stalter 2013, MANHESP 2015, Stalter and Lamont 2016, Sorrie 2021). Populations along the margins of salt ponds may be somewhat more sheltered but they are still in highly saline environments that are occasionally subject to overwash (MANHESP 2015). *Polygonum glaucum* is often a pioneer species in these harsh environments, being one of the first plants to establish on recently deposited sand or sediment (Snyder 2000, Karburg 2019, Leeson 2019). It can colonize new sites aggressively and may become dominant in places where little other vegetation is present (Sorrie 1987, NYNHP 2011, MANHESP 2015). However many populations, including the majority of those in New Jersey, are very small and some occurrences consisting of single plants have been reported (Kelly 2013, Morse and Ventrella 2024, NJNHP 2024). Kelly (2013) noted that some plants do not persist long enough to reproduce.

Populations of *Polygonum glaucum* that are situated farther from the breaking waves may be less ephemeral than those lower on the beach. Kelly (2013) observed that the largest populations along the New Jersey shore were those located at slightly higher elevations, and knotweed plants on the edge of a New York dune increased in abundance with dune height (Hogan et al. 2018). *P. glaucum* can sometimes be found in dunegrass (*Ammophila breviligulatum*) communities (Higgins 1969) and Breden et al. (2001) noted that it may occasionally occur in dune grasslands dominated by *Spartina patens*, *Schoenoplectus pungens*, or both. Although those habitats are generally more stable they still periodically experience shifting substrates or storm overwash.

Sea-beach Knotweed is rarely seen far from beaches, but there have been a few unusual records. Two New York occurrences were situated surprisingly close to urban areas (Raver 1993) and another was found along sandy inland trails (Stalter et al. 1996). *P. glaucum* plants have also occasionally established on ballast, dredge spoils, or other fill material (Snyder 1989, NYNHP 2011)

Wetland Indicator Status

Polygonum glaucum is a facultative upland species, meaning that it usually occurs in nonwetlands but may occur in wetlands (U. S. Army Corps of Engineers 2020).

USDA Plants Code (USDA, NRCS 2024b)

POGL7

Coefficient of Conservancy (Walz et al. 2020)

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 Polygonum glaucum* is restricted to the east coast of the United States (POWO 2024). The map in Figure 1 depicts the extent of Sea-beach Knotweed in North America. Weakley et al. (2024) indicated that northeast Florida appears to be the southern limit of its natural distribution and occurrences on the Gulf Coast may be introduced.

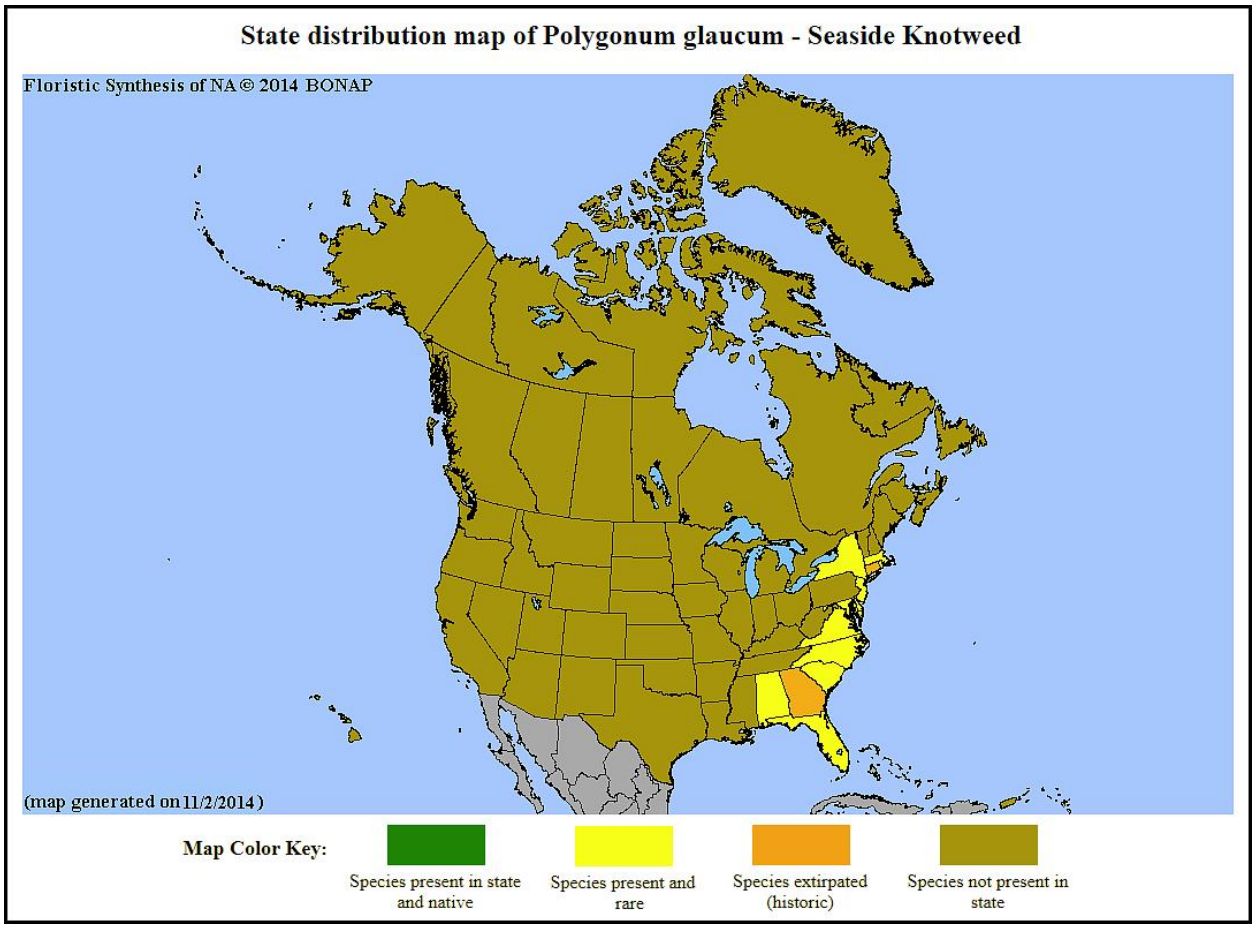


Figure 1. Distribution of P. glaucum in North America, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2024b) shows records of *Polygonum glaucum* in five New Jersey counties: Atlantic, Cape May, Middlesex, Monmouth, and Ocean (Figure 2). The data include historic observations and do not reflect the current distribution of the species.

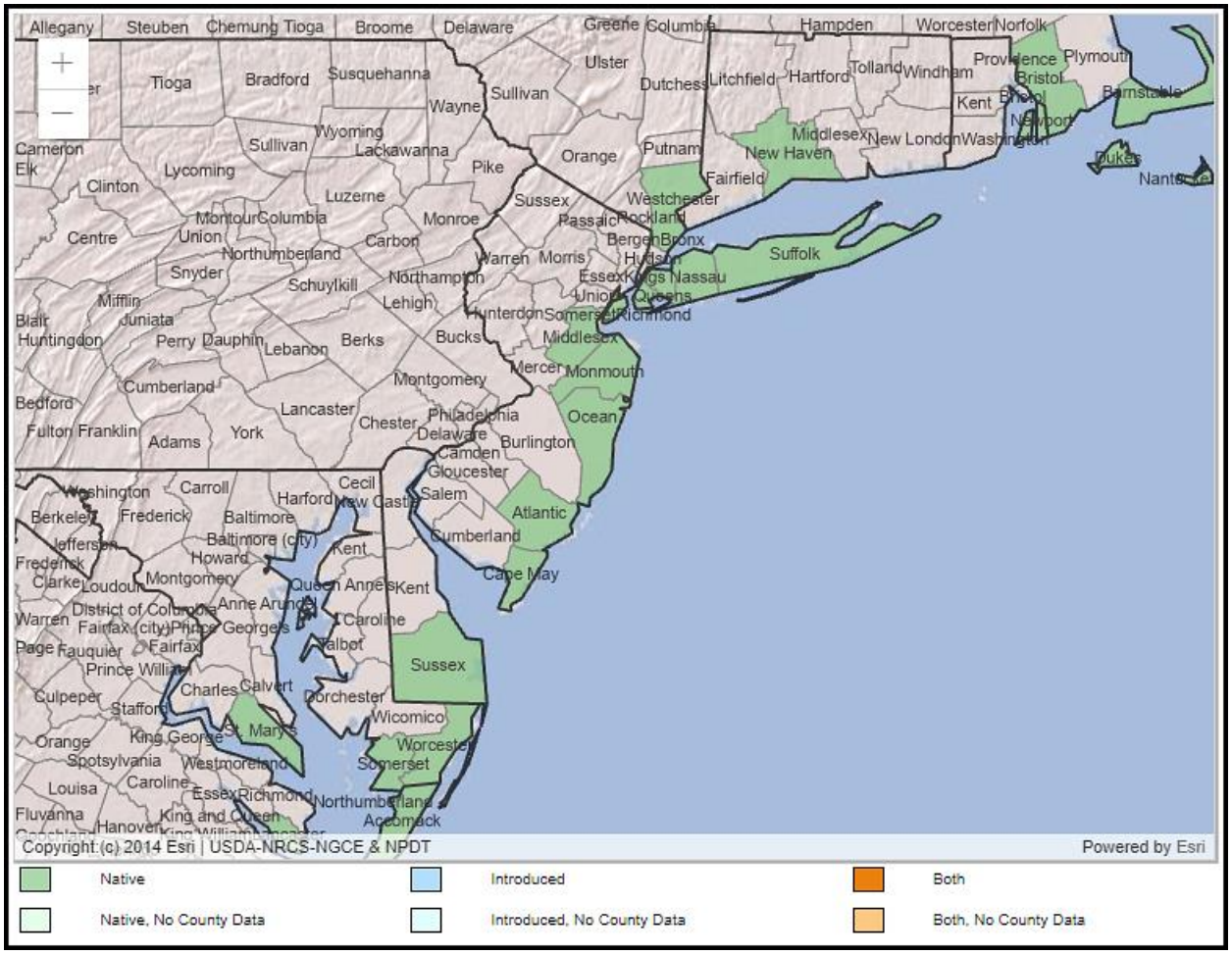


Figure 2. County records of P. glaucum in New Jersey and vicinity (USDA NRCS 2024b).

Conservation Status

Polygonum glaucum is globally vulnerable. The G3 rank means the 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 (NatureServe 2024). The map below (Figure 3) illustrates the conservation status of *P. glaucum* throughout its range. The species is vulnerable (moderate risk of extinction) in two states, imperiled (high risk of extinction) in one state, critically imperiled (very high risk of extinction) in five states, and possibly extirpated in South Carolina, Georgia, and Florida. It has an undetermined status in Connecticut and has not been ranked in Maine.

Polygonum glaucum 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 rank of R3 (vulnerable), signifying a moderate risk of regional extinction (Frances 2017).

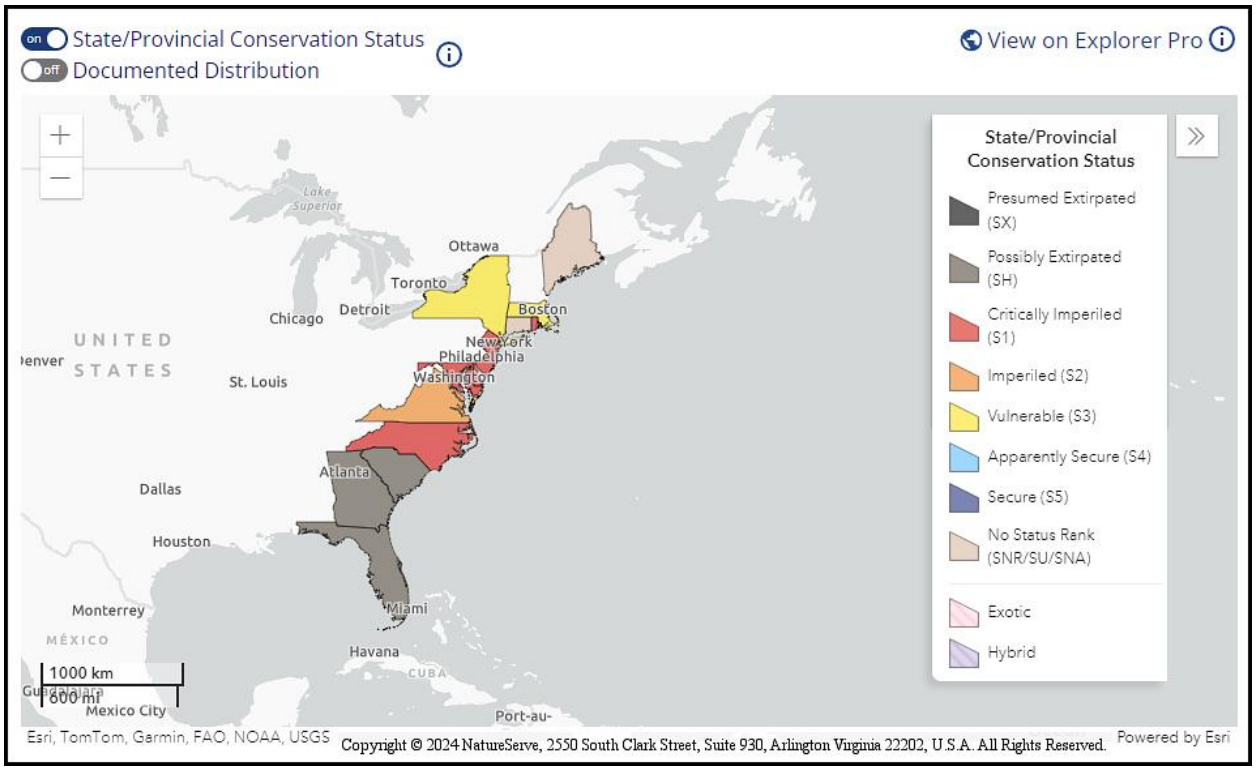


Figure 3. Conservation status of P. glaucum in North America (NatureServe 2024).

New Jersey is one of the states where *Polygonum glaucum* is critically imperiled (NJNHP 2024). The S1 rank often 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. glaucum* 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 the knotweed 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).

Sea-beach Knotweed has been known in New Jersey since at least the early 1800s—Nuttall (1818) used an example from the state to clarify the difference between the Atlantic coast's *Polygonum glaucum* and the European *P. maritimum* for which it had previously been mistaken. *P. glaucum* was frequently seen along the New Jersey coast during the 19th century (Willis 1877, Britton 1889) but by the early 20th century it was reported as uncommon in the state (Stone 1911, Taylor 1915). During the late 1900s *P. glaucum* was rarely encountered: Hough (1983) noted that only two counties had records of the species from the previous half century and Snyder (1989, 1993) spent years searching for the knotweed before locating two very small populations. All of the suitable habitat along the state's shoreline was examined during a series of coastal flora surveys that were conducted from 2001–2011 (Kelly 2013). During that period,

Kelly documented *P. glaucum* at 19 locations in four counties but noted that the populations were generally small and ephemeral, rarely persisting for long at any single location although often reappearing following an absence of a year or more.

Threats

Polygonum glaucum is restricted to the Atlantic coast of the United States, a region that has faced intense development pressure both in the past and during recent decades (Perry and Hershner 1989). Despite increasing threats from rising seas and extensive damage resulting from more frequent and intense storms, shorefront property has not lost its appeal. In New Jersey, the high economic value of shoreline real estate motivates people to rebuild structures that have been destroyed by storms (Nordstrom and Jackson 2018). In an effort to protect developed areas, jetties and other shoreline stabilizing structures have been constructed along the coast, further reducing habitat availability and suitability for *Polygonum glaucum* and other rare beach plants (Marion 2010, MANHESP 2015, Morse and Ventrella 2024). Beach replenishment projects sometimes help the plants by increasing the amount of suitable habitat (Marion 2010, Kelly 2013), but the benefits are often short-lived due to ongoing erosion or increased recreational usage of the sites (Kelly 2014, NJNHP 2024).

The extensive recreational use of beaches poses a significant threat to *Polygonum glaucum* throughout its range. Both foot traffic and off-road vehicle (ORV) traffic can directly damage shoreline plants or bury seeds at depths where they cannot germinate, and the ORVs can also exacerbate erosion. Similar damage can result from management techniques like raking or scraping that are employed to keep the shore in good condition for beachgoers (Sorrie 1987 & 2021, Snyder 1989 & 2000, Carlson 2007, Marion 2010, NYNHP 2011, MANHESP 2015, Morse and Ventrella 2024). Kelly (2014) found that 79–100% of beach surfaces were affected by recreational or maintenance vehicles in places where they were utilized, reducing beach vegetation by 86–99% relative to areas where vehicles had been excluded.

A number of additional threats to *Polygonum glaucum* have been reported in other parts of its range, although they are not currently identified as widespread concerns in New Jersey. Invasive plant species are becoming increasingly prevalent along New England coasts (Heard et al. 2012), with *Glaucium flavum* and *Celastrus orbiculatus* noted as particular concerns in Massachusetts (MANHESP 2015). Introduced animals like feral horses or hogs have been known to trample plants or interfere with dune formation on barrier islands in the south (Taggart 2008). At one location, habitat utilized by Sea-beach Knotweed was damaged by an oil spill from a transport ship (Michel et al. 2008). Seier et al. (2018) reported that *Polygonum glaucum* was susceptible to a fungal leaf spot disease that was being evaluated as a potential control agent for an invasive plant (*Reynoutria japonica*), but the assessment was conducted in a controlled environment so the pathogen does not presently threaten native populations of the rare knotweed.

Climate Change Vulnerability

Information from the references cited in this profile was used to evaluate the vulnerability of New Jersey's *Polygonum glaucum* populations to climate change. The species 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 Sea-Beach Knotweed was assessed as Moderately Vulnerable, meaning that it is likely to show some decrease in abundance or range extent in New Jersey by 2050. The threat may have been underestimated, as the conclusion was reached with only moderate confidence due to a lack of clarity regarding the relative importance of some conflicting factors.

The habitat utilized by *Polygonum glaucum* is highly vulnerable to climate change. The frequency of tidal flooding and storm-induced erosion is already increasing along New Jersey's coast and sea levels are rising faster in the region than in other parts of the world (Hill et al. 2020). Further habitat losses are occurring as a result of efforts to protect property in response to changing conditions. However, a study by Feagin et al. (2005) concluded that fugitive species like *P. glaucum* were likely to fare better than late successional species in coastal habitats. Sorrie (1987) observed that the knotweed was able to compensate for some habitat losses by aggressively colonizing alternate sites, and its high fecundity and rapid maturation also make the species relatively tolerant of disturbances that result from overwash (Fahrig et al. 1993). The critical factor determining the persistence of *P. glaucum* along the New Jersey coast will be the availability of suitable sites for the species to inhabit as former locations are lost. Unfortunately, the natural processes that facilitate the landward migration of coastal habitat are likely to be disrupted by the extensive development adjacent to the beaches and additional activities that are being implemented to safeguard existing structures (Reid and Trexler 1992).

Management Summary and Recommendations

Polygonum glaucum is a difficult species to monitor due to its fugitive habit. Many occurrences consist of only a few individuals (NJNHP 2024), and the low, sprawling plants can easily be overlooked (Gaddy and Raynor 1980). In some instances five-year averages have been used to assess populations because they so frequently fluctuate in size (NYNHP 2011). Due to the ephemeral nature of occurrences it makes more sense to focus management efforts on maintaining a sufficient amount of suitable habitat for *P. glaucum* rather than attempting to track individual populations.

Relatively simple and cost-effective measures have already proven to be effective in restoring populations of *Polygonum glaucum* and other sensitive beach plants. Vegetation has quickly reestablished in many places where string fencing and signage were erected to protect rare plants or nesting beach birds (Marion 2010, NYNHP 2011, Kelly 2016, Hogan et al. 2018). New Jersey has also developed some cooperative agreements with federal agencies and municipal land managers in order to limit damage from vehicular traffic or beach maintenance practices (NJNHP 2024). Particularly critical locations may require restricting access for recreational

purposes and implementation of stringent guidelines for the use of essential vehicles (Marion 2010). In some places additional efforts are needed to control the spread of invasive species (Marion 2010, MANHESP 2015). While that is not presently identified as a concern in New Jersey, owners of shoreline properties are encouraged to permit the growth of natural vegetation or utilize native plants in landscaped areas (Nordstrom and Jackson 2018, NJNHP 2024). Long-term conservation planning for *P. glaucum* should include the consideration of places where coastal communities will have room to move further inland as sea levels continue to rise.

The global vulnerability of *Polygonum glaucum* warrants an investment in research to fill gaps in knowledge about the species. A better understanding of issues such as pollinator relationships, self-compatibility, genetic variability, seed dispersal distances and longevity, or germination triggers could help to predict the species' capacity to survive in a rapidly changing environment.

Synonyms

The accepted botanical name of the species is *Polygonum glaucum* Nutt. Orthographic variants, synonyms, and common names are listed below (ITIS 2024, POWO 2024, USDA NRCS 2024b). *Polygonum glaucum* was initially identified as an American form of *P. maritimum* and although Nuttall (1818) made it clear that *P. maritimum* did not occur in North America use of the name persisted for a long time: A century or more later botanists were still imploring their colleagues to recognize the distinction between the two very different species (eg. Fernald 1913 & 1915, Bicknell 1918, Long 1924, Löve and Löve 1956).

Botanical Synonyms	**Common Names**
Polygonum maritimum auct. non L.	Sea-beach Knotweed
Polygonum aviculare var. *glaucum* (Nutt.) Torr.	Seaside Knotweed

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