

Suaeda rolandii

Roland's Seablite

Chenopodiaceae



Suaeda rolandii by David Mazerolle, 2020

***Suaeda rolandii* 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

Suaeda rolandii (Roland's Seablite) is a halophytic (salt-loving) taprooted annual herb that has traditionally been placed in the Chenopodiaceae. Some taxonomists now include the goosefoot family in the Amaranthaceae (APG II 2003, Kartesz 2015) but others retain Chenopodiaceae a distinct group (Ferren and Schenk 2020, Weakley et al. 2022). *Suaeda* contains more than 100 species worldwide and the genus has been divided into sections. All of the species that occur in the eastern United States, including *S. rolandii*, are in section *Brezia*: Characteristics of the group include smooth leaves with C3 anatomy, tepals that do not adhere to the ovary, short stigmas which are inserted directly on tip of a tapering ovary, and horizontal seeds (Fisher et al. 1997, Schenk and Ferren 2001, Schütze et al. 2003).



Bayard Long (1910), courtesy V-Plants.



Lena Dietz Chiasson, 2016.



David Mazerolle, 2020.

The stems of *Suaeda rolandii* are 2–7 dm long and they may be erect or trail on the ground. A few branches (one to several) are usually present on the upper half, and the basal part of the stems tend to become woody as the plants approach maturity. The smooth, linear leaves are fleshy and succulent, ranging from 1.7–3.0 cm in length and 0.7–1.5 mm in width, and the lowest ones are longer than those near the inflorescence. *S. rolandii* flowers occur in small clusters of 1–3 in the axels of the stem and lateral branches. The flowers are usually perfect and have 2–5 stamens and 2–3 stigmas. The perianth is about 2–4 mm wide and has five hooded, keeled lobes that can be somewhat unequal so the flowers are generally irregular in shape or bilaterally symmetrical. *S. rolandii* plants have two kinds of seeds: Both types can vary from 1.5–2.3 mm

in diameter but those produced earlier in the season are black or red-brown, biconvex, and shiny while those that develop later are dull brown and flat. (See Bassett and Crompton 1978, Clemants 1992, Munroe et al. 2014, Ferren and Schenk 2020).

Suaeda species are notoriously difficult to identify because they display a high degree of morphological plasticity in response to environmental conditions, including salinity and the availability of water and nutrients (Hopkins and Blackwell 1997, Brandt et al. 2015). Positive identification can be aided by examination of both flowers and mature fruits with seeds (Ferren and Schenk 2020). *Suaeda rolandii* flowers during August and September and the fruits mature during September and October (Clemants 1992). Bayard Long's 1910 specimen from New Jersey, which was cited in the original description of *Suaeda rolandii* (Bassett and Crompton 1978), was collected on September 21.

Three other *Suaeda* species occur in New Jersey and may be found growing in the same places as *S. rolandii*—*Suaeda calceoliformis*, *S. linearis*, and *S. maritima* ssp. *maritima*. Munroe et al. (2014) noted that the fruits of *Suaeda rolandii* mature later than those of *S. maritima* and *S. calceoliformis*. Seed size can help to separate *S. rolandii* from *S. calceoliformis* and *S. linearis*, which have seeds that are under 1.5 mm in diameter. *S. maritima* does not have dimorphic seeds (Ferren and Schenk 2020) and its sepal lobes are not keeled (Clemants 1992). Bassett and Crompton (1978) pointed out that despite a superficial resemblance to *S. maritima*, *Suaeda rolandii* could be readily distinguished by the large protuberances on its mature perianths. The pollen of *S. rolandii* is also distinctive, exhibiting larger and more numerous pores than the other species when viewed through a scanning electron microscope (Crompton 1982), although that feature is not useful for field identification.

There is a dearth of species-specific information available regarding the life cycle and ecology of *Suaeda rolandii*. Munroe et al. (2014) remarked that "little is known of this species." Both Fernald (1907) and Hopkins and Blackwell (1977) opined that plants in the genus *Suaeda* were often ignored by botanists because they were relatively unattractive and difficult to identify. However, the paucity of research on *S. rolandii* is probably due to the fact that the species was first described less than 50 years ago (Bassett and Crompton 1978) and also to its global rarity. *Suaeda rolandii* is a decaploid ($2n = 90$) species that was formerly thought to have two 'parents' (*S. calceoliformis* and *S. maritima*) but recent evidence suggests that it originated via allopolyploidy, inheriting multiple sets of chromosomes from *S. maritima* (Brandt et al. 2015). The close relationship provides a reasonable basis for making some inferences about *Suaeda rolandii* based on studies of *S. maritima*.

Pollinator Dynamics

Plants in the genus *Suaeda* are broadly characterized as wind-pollinated and self-compatible (Bassett and Crompton 1978, Brandt et al. 2015). A detailed pollination study of three species (*Suaeda maritima*, *S. monoica*, and *S. nudiflora*) was carried out by Raju and Kumar (2016). The flowers of all three were protogynous: The stigmas were receptive one day prior to blooming and protruded from the buds but withered before the flowers expanded and the anthers released their pollen. Wind pollination was prevalent in high marsh habitats but in low marsh

communities pollen was also transferred by water. All three species produced tiny amounts of nectar during their staminate phase and were visited by an assortment of insects with bees, wasps, and flies serving as pollinators. Although all of the *Suaeda* species examined were capable of producing viable seed when fertilized with pollen from another flower on the same plant, cross-fertilization was promoted by the fact that only a limited number of flowers were in the staminate phase each day so insects were motivated to visit multiple plants in order to obtain consequential amounts of pollen or nectar. Ants were also capable of effectively transferring pollen but most of their movement occurred between flowers on the same plant.

Seed Dispersal and Establishment

Suaeda fruits are single-seeded (Ferren and Schenk 2020). Bassett and Crompton (1978) indicated that *S. rolandii* had high rates of seed set and viability but no information was found regarding its dispersal mechanisms or germination requirements. In the three species studied by Raju and Kumar (2016) the plants were often observed to break off and roll around on the ground, shedding seeds along the way. Water usually plays an important role in the dispersal of other seablites. The seeds are initially buoyant and some (including those of *S. maritima*) may remain afloat for weeks or even months. Waterlogged seeds that have been deposited on shore can experience additional movement as the result of tidal flow or wave action (Chang et al. 2008, Lonard et al. 2016). Flow-related movement is affected by local vegetation structure because some types of plants are more likely to trap seeds (Tessier et al. 2002, Chang et al. 2008). The possibility of bird dispersal was suggested for *Suaeda linearis* (Lonard et al. 2016).

Unlike *Suaeda rolandii*, which has two kinds of seeds, those of *S. maritima* are monomorphic. Studies of four other *Suaeda* species with dimorphic seeds determined that the two seed types have different germination requirements. The flat brown seeds are non-dormant at maturity, imbibe water faster, germinate at higher rates in a wider range of conditions, and do not form a persistent seed bank. The hard-coated black seeds are dormant at maturity and are more sensitive to salinity and water stress but they can persist in the soil for a long time awaiting favorable conditions for germination. (See Cao et al. 2012, Wang et al. 2008, Wang et al. 2012, Zhang et al. 2021).

Seeds of halophytic species usually germinate during the spring, allowing the seedlings to become established before dryer weather patterns exacerbate salt stress (Keiffer and Ungar 2002). In controlled conditions, germination of *S. maritima* was triggered when temperatures reached about 15°C (Wetson et al. 2008). In natural settings, seedlings of *S. calceoliformis*, *S. linearis*, and *S. maritima* emerged between late March and early May (Youngman and Heckathorn 1992, Wetson et al. 2008, Lonard et al. 2016). The formation of mycorrhizae has been reported for several species in the genus, including *S. maritima* (Wang and Qiu 2006).

Habitat

Suaeda rolandii grows at elevations of 1–10 meters above sea level. Plants in the genus *Suaeda* are generally halophytes (Fisher et al. 1997, Brandt et al. 2015). *S. rolandii* is mainly found in

salt marshes but it also occurs on tidal flats along rivers or creeks. The species may extend inland as far as the upper reaches of the high marsh. Typical associates are aquatic grasses such as *Spartina* spp. (Bassett and Crompton 1978, Crompton 1982, Clemants 1992, Crowley et al. 2005, Ring 2011, Ferren and Schenk 2020). At one New Jersey site *Suaeda rolandii* was found growing with both *S. calceoliformis* and *S. linearis* (NJNHP 2024).

Studies of *Suaeda maritima* found that the species could rapidly colonize disturbed sites in saline habitats, becoming dominant shortly after a disturbance but gradually disappearing as other plant species established (Tessier et al. 2002, Erfanzadeh et al. 2010). *Suaeda rolandii* may behave similarly following disturbance—it has been known to establish on suitable habitat in highly developed areas (Raver 1993), adjacent to roads and landfills (Crowley et al. 2005), and on dredge spoils (Ring 2011).

Wetland Indicator Status

Suaeda rolandii is not included on the National Wetlands Plant List (NWPL). In most cases, a species that is not on the NWPL is considered to be Upland (UPL) in all regions where it occurs, meaning that it almost never occurs in wetlands. However, other species of *Suaeda* that occur in comparable habitat have been ranked as OBL or FACW, signifying that they are nearly always found in wetlands (U. S. Army Corps of Engineers 2020). Since all of the reported habitats for *S. rolandii* are in tidal wetlands the omission was likely an oversight.

USDA Plants Code (USDA, NRCS 2024)

SURO

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 *Suaeda rolandii* is restricted to eastern Canada and the northeastern United States (POWO 2024). The map in Figure 1 depicts the known extent of the species.

The USDA PLANTS Database (2024) shows *Suaeda rolandii* in New Jersey but does not provide records by county. The map in Figure 2 shows the known distribution of Roland's Seablite in the state. The records include both historic and current observations.

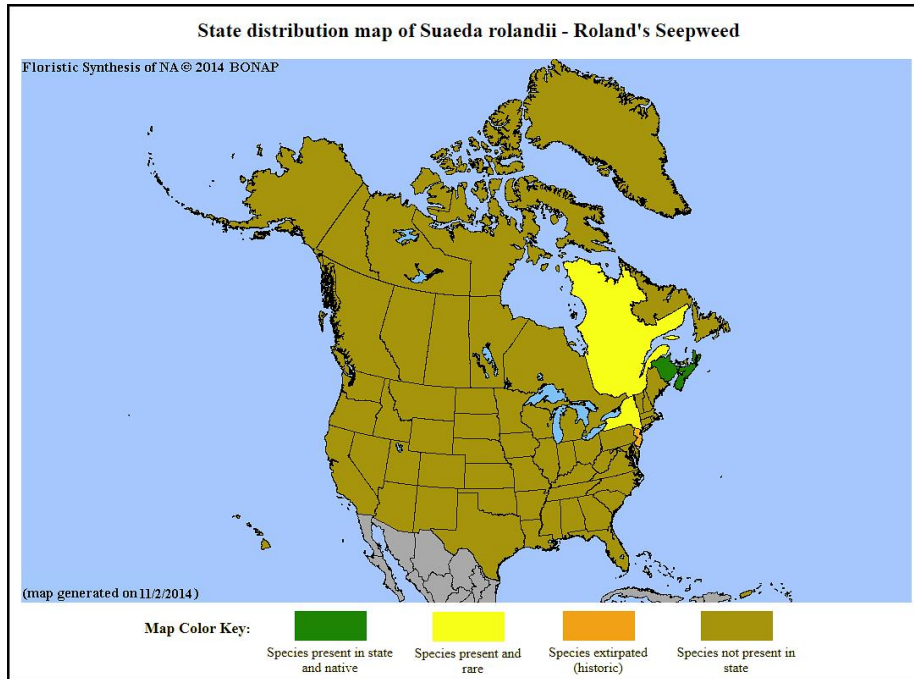


Figure 1. Distribution of *S. rolandii* in North America, adapted from BONAP (Kartesz 2015).

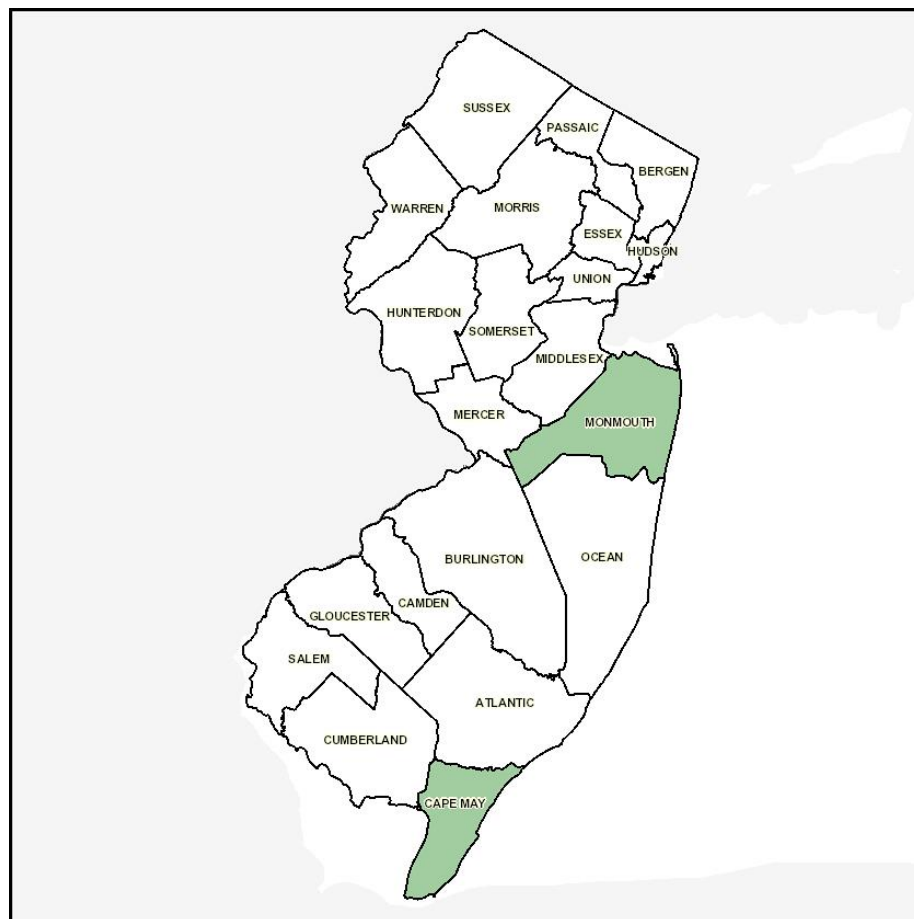


Figure 2. County records of *S. rolandii* in New Jersey ((source data from NJNHP 2024).

Conservation Status

Suaeda rolandii has a global rank of G1G2, meaning there is some uncertainty as to whether it should be considered critically imperiled or imperiled worldwide. A G1 species has a very high risk of extinction or collapse due to a very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors. A G2 species has a high risk of extinction and faces a similar suite of risk factors but at a slightly lower level of intensity. The need for an updated status review has been noted (NatureServe 2024). The map below (Figure 3) illustrates the conservation status of *Suaeda rolandii* throughout its range. Roland's Seablite is critically imperiled in all of the districts where it is thought to be extant (two provinces and two states) and possibly extirpated in Quebec.

In the United States, *S. rolandii* was previously identified as a species for which protection at the federal level may be appropriate but no action was taken due to a lack of data regarding its biological vulnerability so it presently remains unlisted (USFWS 1993, 2024). At the continental level, *S. rolandii* has 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 regional extinction (Frances 2017).

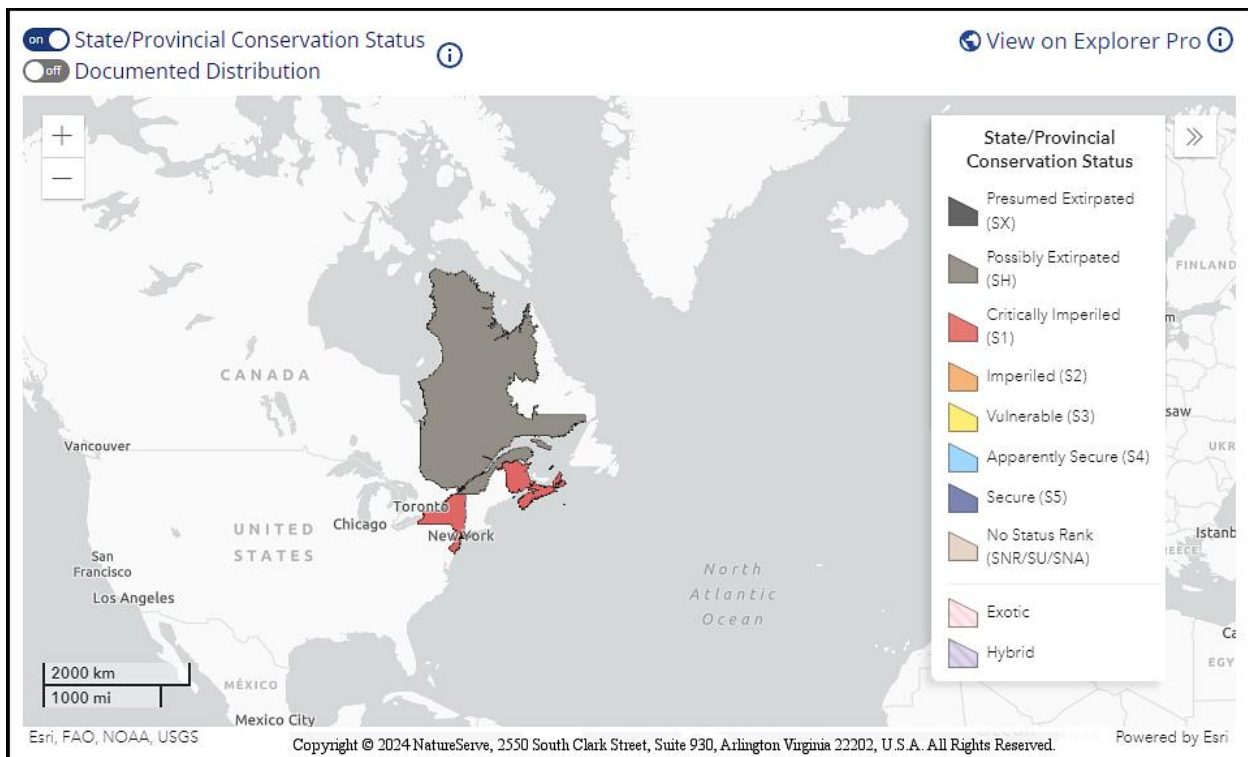


Figure 3. Conservation status of *S. rolandii* in North America (NatureServe 2024).

Suaeda rolandii 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. Roland's Seablite 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 *S. rolandii* 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).

Bayard Long collected a specimen of *Suaeda rolandii* in New Jersey in 1910 but it remained unidentified until it after was examined by Bassett and Compton in 1976. The occurrence is now ranked as historical. Following the publication of the species' description by Bassett and Crompton in 1978, three more populations were documented in Monmouth and Cape May counties by David Snyder and those are currently the only extant occurrences tracked by the Natural Heritage Program (NJNHP 2024). *Suaeda rolandii* apparently also grows at an additional location, as seeds and material for chromosomal analyses were collected from three sites in Monmouth County (probably subpopulations of a single occurrence) during 2010 (Brandt et al. 2015, Lomonosova and Freitag 2017).

Threats

No threats to the three populations of *Suaeda rolandii* that are tracked by the Natural Heritage Program were identified but only one of the sites has been monitored since the occurrences were first discovered during the 1990s (NJNHP 2024). In New York, reported threats to *S. rolandii* populations have included shoreline development, human activity (such as damage from boats and all terrain vehicles), encroachment by *Phragmites australis* ssp. *australis*, and habitat erosion resulting from severe weather (Crowley et al. 2005, Ring 2011).

Climate Change Vulnerability

Information from the references cited in this profile was used to evaluate the vulnerability of New Jersey's *Suaeda rolandii* 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 *S. rolandii* was assessed as Moderately Vulnerable, meaning that it is likely to show some decrease in abundance or range extent in New Jersey by 2050. Threats to *S. rolandii* from climate change may have been underestimated due to the lack of species-specific information regarding many aspects of the plant's life history.

New Jersey's coastal communities are already experiencing increasing rates of tidal flooding and sea levels are rising faster in the region than in other parts of the world (Hill et al. 2020). *Suaeda rolandii* is restricted to saline coastal wetlands, and as those communities are eliminated by rising seas the intense development that has taken place along New Jersey's shoreline has left little room for the formation of new salt marshes and flats. Other local effects of climate change

include rising temperatures and altered precipitation patterns that result in more intense storms and lengthier droughts (Hill et al. 2020). While the effects of heat and drought on *S. rolandii* have not been studied, severe storms along the coast have caused significant erosion along New Jersey's shoreline in recent years.

Management Summary and Recommendations

Suaeda rolandii is critically imperiled worldwide and should be prioritized for conservation in the few places where it occurs. Roland's Seablite is restricted to a narrow selection of habitats and has a small global range. Although the species' distribution extends from southeastern Canada to New Jersey it is largely absent from New England (Ferren and Schenk 2020, Weakley et al. 2022, also see Figures 1 & 3).

In New Jersey, a comprehensive status review is required for *Suaeda rolandii*. Every extant population is in need of an onsite evaluation to determine population size, vigor, and viability and to assess habitat conditions and identify threats. Based on the outcome of the surveys, some management may be needed to preserve habitats, limit human activities that damage plants, or control the spread of invasive species. Searches for historical and de novo populations should also be undertaken. Focused efforts to document *S. rolandii* in New York turned up some new occurrences (Lamont and Fitzgerald 2001), and Crowley et al. (2001) suggested that the extent of the species may be underreported throughout its range.

Fundamental information is lacking regarding the pollination system, dispersal mechanisms, and germination and establishment requirements of *Suaeda rolandii*. An investment in research is recommended in order to provide a more substantial foundation for the conservation of this globally rare species.

Synonyms

The accepted botanical name of the species is *Suaeda rolandii* Bassett & C. W. Crompton. Orthographic variants, synonyms, and common names are listed below (ITIS 2023, POWO 2024, USDA NRCS 2024).

Botanical Synonyms

Common Names

Roland's Seablite
Roland's Seepweed

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