Puccinellia fasciculata

Saltmarsh Alkali Grass

Poaceae

Puccinellia fasciculata by Bas Kers, CC BY-NC-SA 2.0 via Wikimedia Commons

***Puccinellia fasciculata* 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

Puccinellia fasciculata (Saltmarsh Alkali Grass) is a short-lived perennial grass of saline habitats. The plants grow in tufts and have leaves 2–6 mm wide which may be flat, folded or rolled inward. Flowering stems are typically 10–70 cm in height, and are often distinctly bent near the base and somewhat so at the nodes. The inflorescence is a panicle 5–15 cm in length with stiffly ascending branches. The lower panicle branches bear spikelets below the middle, and often all the way down to the base of the branch. Spikelets are 3–6 mm long and have 2–6 florets. *P. fasciculata* produces flowers between May and July. (See Fernald 1950, Hitchcock 1950, Tiner 2009, Mittelhauser et al. 2019, Davis and Consaul 2021).

Three other species of *Puccinellia* occur in New Jersey: *P. distans*, *P. maritima*, and *P. rupestris* (Kartesz 2015). All tend to occupy similar habitats. The lower panicle branches of *P. distans* and *P. maritima* bear spikelets only above the middle and both species are likely to flower later in the season (Tiner 2009, Mittelhauser et al. 2019). *Puccinellia rupestris* has longer grains (1.8–2.5 mm) and lemmas with prominent midveins in comparison to *P. fasciculata* which has shorter grains (1.4–1.7 mm) and lemmas with obscure midveins (Fernald and Weatherby 1916, Davis and Consaul 2021).

Left: Britton and Brown 1913, courtesy USDA NRCS 2022a. Right: Andrea Moro, CC BY-SA 4.0 via Wikimedia Commons.

Pollinator Dynamics

All members of the grass family are primarily wind-pollinated (Garcia-Mozo 2017), and even for species that also utilize insects as pollinators wind is the most important means of cross-fertilization (Schulze-Albuquerque et al. 2019). While *Puccinellia fasciculata* is generally reported to be wind-pollinated (Lozano et al. 2003), Jones and Newton (1970) observed that the anthers of *P. fasciculata* do not protrude far beyond the enclosing bracts and are not well exposed for wind pollination although most grasses that rely on wind have dangling anthers (Garcia-Mozo 2017).

In addition to having small anthers, *Puccinellia fasciculata* is a short-lived perennial that frequently behaves like an annual, and annual plants are often self-compatible in order to take advantage of a short window for reproduction (Jones and Newton 1970). Connor (1988) reported self-compatibility in two varieties of *P. fasciculata* which are now included as synonyms of the species. Some other members of the genus have been found to have very low rates of self-compatibility, including *Puccinellia distans* (Smith 1944) and *P. maritima* (Gray and Scott 1977), while cleistogamy has been reported from at least one species in Uruguay (Campbell et al. 1983).

Seed Dispersal

The fruit of *Puccinellia fasciculata* is a dry, one-seeded grain that may be released freely or with the palea or both lemma and palea attached (Davis and Consaul 2021). Multiple means of dispersal have been identified for the species. Water is of primary importance: *P. fasciculata* seeds are transported by tides into adjacent habitats (Mossman et al. 2010) and are then deposited into low, middle, and high portions of the marsh (Dausse et al. 2008). Birds may also play a role in dispersal, as *P. fasciculata* seeds have been found in the digestive tracts of dabbling ducks (Green et al. 2016). Some wind dispersal has additionally been reported (Conte et al. 2020).

Although *P. fasciculata* seeds germinate readily (Jones and Newton 1970), successful development may depend on site conditions. Beeftink (1966) reported that compact, relatively unvegetated soil with fluctuations in salinity and moisture levels is favorable substrate for the establishment of Saltmarsh Alkali Grass. Once established, the grass is able to spread rapidly by vegetative means (Álonso et al. 2010).

Habitat

Puccinellia fasciculata is most frequently associated with saline or brackish marshes in coastal regions (Harger et al. 1917, Bean et al. 1946, Hitchcock 1950, Thannheiser and Holland 1994, Terrell and Peterson 2009, Mittelhauser et al. 2019, Weakley 2015). Additional coastal habitats include brackish shorelines, sandy shores, or barrier islands (Angelo and Boufford 1998, Tiner 2009). A specified vegetation community where the grass is often present is the *Spartina patens*–(*Distichlis spicata*) [Saltmeadow Cordgrass–(Saltgrass)] Tidal Herbaceous Alliance (Breden et al. 2001). Saltmarsh Alkali Grass also occurs at inland sites with naturally brackish

soils such as salt flats, salt meadows, salt pans, and mud volcanoes (Billings 1945, Faust and Roberts 1983, Edgar 1996, Conte et al. 2020, Mid-Atlantic Herbaria 2022). More recently, the species has become established in wet ditches along heavily salted roadways in North America and Europe (Oldham et al. 1995, Smith and Sangwine 2002, Poindexter and Thompson 2010).

Controlled growth studies have shown that *Puccinellia fasciculata* does not require salt in order to flourish (Partridge and Wilson 1987) and the species has been cited as sometimes occurring in freshwater marshes (Tiner 2009). Jones and Newton (1970) characterized *P. fasciculata* as a poor competitor that utilizes temporary habitats formed by coastal erosion or human disturbance, so its ability to tolerate saline environments gives the plant an opportunity to establish in communities where many other species are unable to grow. Alvarez-Cobelas et al. (2001) reported a new occurrence of the species at a location in Spain following an increase in the site's salinity.

New Jersey's *Puccinellia fasciculata* populations occur in tidally influenced saline habitats (NJNHP 2022). Beeftink (1966) referred to the portion of the salt marshes occupied by *P. fasciculata* as the 'disturbance zone' due to large fluctuations in salinity. A Connecticut study of coastal vegetation zones associated *P. fasciculata* with the upper littoral marsh, characterized by a firm, peaty substrate with interwoven root systems and small but significant variations in elevation (Nichols 1920). Within that matrix, Nichols noted that *P. fasciculata* was most likely to be found in open, well-drained locations where competitors were not abundant.

The growth and appearance of Saltmarsh Alkali Grass may vary depending on its habitat conditions (Edgar 1996). Jones and Newton (1970) concluded that one formerly named species—*Puccinellia pseudodistans*—was actually an environmentally induced growth form of *P. fasciculata*. The variation in form was determined by water availability in different sections of the habitat, with more robust plants occurring where water was more abundant. An investigation of salt tolerance in a suite of coastal plants determined that the optimal salinity range for maximum growth of *Puccinellia fasciculata* was 0.5–1.5% while plants growing at salinity ranges from 1.5-2% were likely to achieve about half of their potential (Partridge and Wilson 1987). The species did not tolerate salinity levels above 2.5%.

Wetland Indicator Status

Puccinellia fasciculata 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 2022b)

PUFA

Coefficient of Conservatism (Walz et al. 2018)

CoC = 7. 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

Puccinellia fasciculata is known from scattered locations around the world, including North America, western Europe, northwestern and southern Africa, and Oceania (POWO 2022). The species is native in Europe and northwest Africa and introduced in southern Africa, Australia and New Zealand. Populations in the western United States are introduced, but the native status of *P. fasciculata* in northeastern U. S. and Canada is unresolved (Morse 2001, Weakley 2015, Davis and Consaul 2021). The map in Figure 1 depicts the extent of the species in North America.

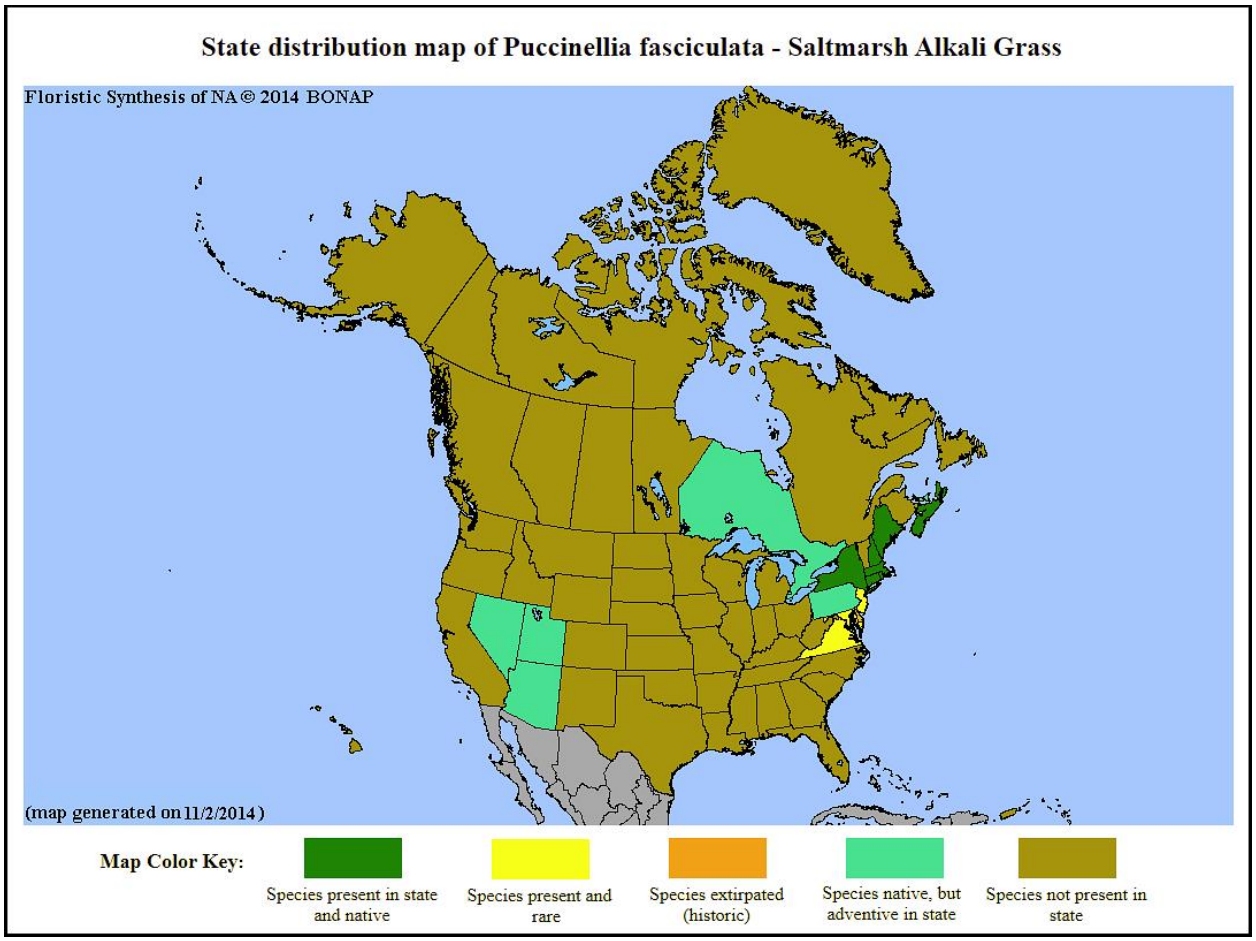

Figure 1. Distribution of P. fasciculata in North America, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2022b) shows records of *Puccinellia fasciculata* in nine New Jersey counties: Atlantic, Camden, Cape May, Cumberland, Gloucester, Hudson, Middlesex, Ocean, and Salem (Figure 2, below). The data include historic observations and do not reflect the current distribution of the species. A specimen labeled as originating in Hunterdon County

was reported from the Friesner Herbarium at Butler University, Indiana (Mid-Atlantic Herbaria 2022).

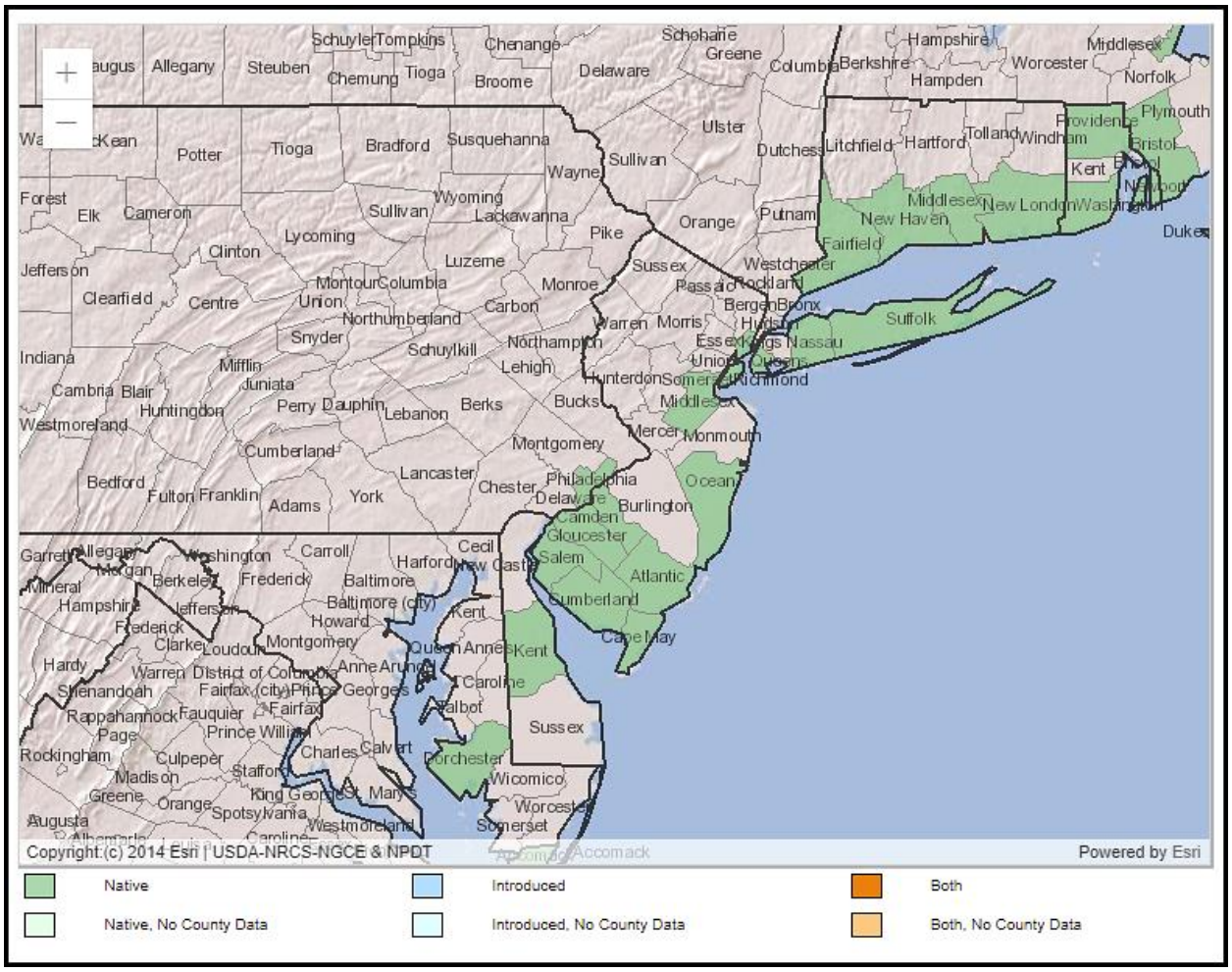

Figure 2. County records of P. fasciculata in New Jersey and vicinity (USDA NRCS 2022b).

Conservation Status

Puccinellia fasciculata has a global rank of G3G5, meaning there is significant uncertainty as to whether it should be considered vulnerable, apparently secure, or secure. A G3 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. A G5 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 below (Figure 3) illustrates the conservation status of *P. fasciculata* in the United States and Canada, and also the uncertainty regarding its nativity in the northeastern states. The species is shown as exotic in Maine, Maryland, New York, and in the three Canadian provinces where it occurs. It is unranked in Connecticut and presumed extirpated in Delaware, Massachusetts, and

Virginia. Additional records have been reported from Pennsylvania, where the species was considered introduced (Wherry 1968).

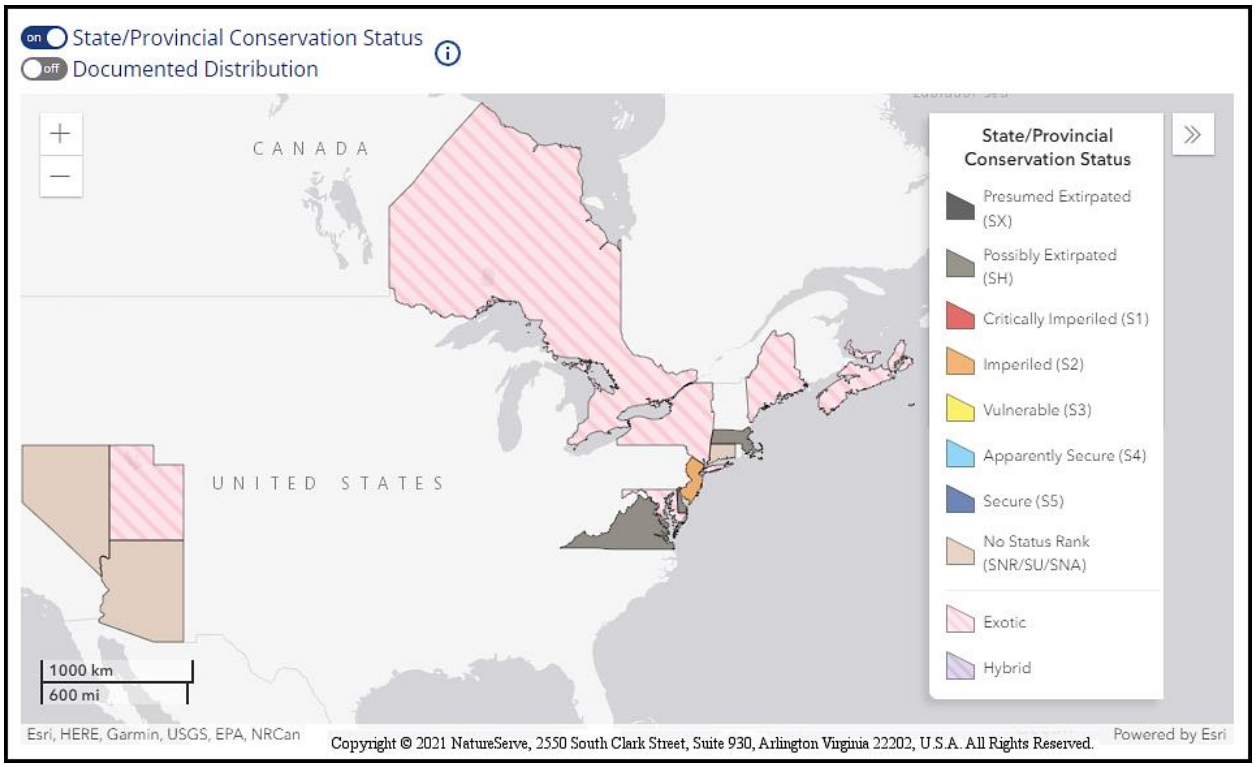

Figure 3. Conservation status of P. fasciculata in North America (NatureServe 2022).

Puccinellia fasciculata is imperiled (S2) in New Jersey (NJNHP 2022). The rank indicates that a the species is very rare in the state, with 6–20 occurrences. Species with an S2 rank may have once been more abundant in the state but now persist in only a few of their former locations. *P. fasciculata* has also been assigned a regional status code of HL, signifying that the species is eligible for protection under the jurisdiction of the Highlands Preservation Area (NJNHP 2010).

The official description of *P. fasciculata* was based on plants collected in North America, although the grass was originally included in the genus *Poa* (Torrey 1824). Two dozen years later the genus *Puccinellia* was first named in Italy (Parlatore 1848), but the epithet was not immediately adopted in the United States. Early reports recognized only one *Puccinellia* in New Jersey, initially including it in the genus *Glyceria*, and the Eurasian species *Puccinellia (Glyceria) distans* was reported from both ballast dumps and coastal salt meadows (Britton 1881, 1889; Keller and Brown 1905). Following Bicknell's (1908) renaming of the plant, Stone (1911) included all previously reported south Jersey occurrences under *Puccinellia fasciculata*. Shortly thereafter, Taylor (1915) indicated that both species were present in New Jersey—identifying *P. fasciculata* as a rare native species and *P. distans* as a likely introduction—and Fernald and Weatherby (1916) concluded that *P. fasciculata* was native to the North American coast as well as to Europe although some local occurrences (e.g. in ballast) had been introduced. Due to the absence of solid evidence to the contrary, *Puccinellia fasciculata* continues to be treated as native species in New Jersey (Snyder 2000).

While never abundant in New Jersey, *Puccinellia fasciculata* appears to have maintained a small but continuous presence in the state as disappearances from known locations were sometimes offset by discoveries of the plant at new sites (e.g. Moore 1989, Moore et al. 2016). Six former New Jersey occurrences have been extirpated and another 15 are considered historic. The state presently has nine extant occurrences of Saltmarsh Alkali Grass, four with an estimated viability rank of 'Fair' and five of which were recently discovered and have not yet been ranked (NJNHP 2022).

Threats

New Jersey's coastal region has been highly developed and the impacts of construction and recreational activities often extend into the upper reaches of tidal areas where *Puccinellia fasciculata* may occur. Potential habitat has been eliminated at many locations, and both the direct destruction of plants and threats to extant populations have been reported as a result of fill deposition for roadside stabilization, road edge maintenance activities (e.g. mowing, weed-whacking, snowplowing), vehicular traffic, and foot traffic (NJNHP 2022).

Because *P. fasciculata* does best in open, lightly vegetated habitats, individual occurrences are likely to be eradicated by competition. In some instances that is a normal process which would be offset by the colonization of freshly disturbed sites. However, the establishment of new plants is reliant upon both the availability of suitable habitat and the presence of a seed source. A particularly problematic competitor that has been reported at a number of New Jersey's Saltmarsh Alkali Grass occurrences is the invasive Common Reed (*Phragmites australis* ssp. *australis*), which forms large monospecific stands to the detriment of other plant species. Another non-native plant, Mexican Fireweed (*Bassia scoparia*) was also identified as a threat to one *P. fasciculata* population (NJNHP 2022).

The likely impact of climate change on *Puccinellia fasciculata* depends on the rate and intensity of sea level rise. At a slower pace, marsh vegetation could potentially establish further inland and increasing salinity and erosion might create new locations favorable for colonization by Saltmarsh Alkali Grass. However, New Jersey is experiencing a rapid rate of sea level rise that could result in the loss of coastal marshlands if shifts in vegetative communities cannot keep pace with the changes (USEPA 2016). Increasingly severe storms may also pose a threat to some *P. fasciculata* occurrences. An evaluation of the impact of Superstorm Sandy in 2012 on coastal marsh vegetation showed different results for *P. fasciculata* at two sites: One population persisted but another was eradicated (Rachlin 2017).

Management Summary and Recommendations

Clarification is needed in order to ascertain whether or not *Puccinellia fasciculata* is indigenous to eastern North America (Morse 2001). Resolution of the debate around the species' nativity will help to determine the level of effort that should be invested in its regional conservation.

Restoration studies have shown that *P. fasciculata* is able to disperse to and establish in favorable habitat when there is a nearby seed source (Dausse et al. 2008, Alvarez-Cobelas et al. 2001, Mossman et al. 2010). Maintenance of viable populations may depend on natural or artificial disturbances for the creation of the early successional habitats utilized by the species. Preservation of extant populations will assure that there is source material for the initiation of new colonies. Additional information regarding seed longevity and dispersal mechanisms would be useful if *P. fasciculata* becomes critically imperiled and requires assistance in establishing at new sites.

Synonyms

The accepted botanical name of the species is *Puccinellia fasciculata* (Torr.) E. P. Bicknell. Orthographic variants, synonyms, and common names are listed below (ITIS 2021, USDA NRCS 2022b, NatureServe 2022, POWO 2022, Davis and Consaul 2021, Hough 1983).

Botanical Synonyms	Common Names
Atropis borreri (Bab.) K. Richt.	Saltmarsh Alkali Grass
Atropis conferta (Fr.) Rouy	Torrey's Meadow Grass
Atropis distans var. *conferta* (Fr.) Beal	Torrey Alkaligrass
Atropis flahaultii Sennen & Mauricio	Salt Marsh Goosegrass
Atropis permixta (Guss.) K. Richt.	Borrer's Saltmarsh Grass
Atropis pseudodistans (Crép.) Rouy	Tufted Salt-marsh Grass
Festuca borreri Bab.	Eastern Alkali Grass
Festuca delawarica (Link) Kunth	
Festuca thalassica var. *delawarica* (Link) Bernh.	
Glyceria ambigua Pauquy	
Glyceria borreri (Bab.) Bab.	
Glyceria conferta Fr.	
Glyceria conferta ssp. *pseudodistans* (Crép.) P. Fourn.	
Glyceria delawarica (Link) Heynh.	
Glyceria distans ssp. *conferta* (Fr.) Hook. f.	
Glyceria distans ssp. *pseudodistans* (Crép.) Bég.	
Glyceria maritima Roep. ex Nyman	
Glyceria neesii Steud.	
Glyceria permixta Guss.	
Glyceria pseudodistans Crép.	
Glyceria pungens Pau	
Molinia conferta (Fr.) Hartm.	
Phippsia fasciculata (Torr.) Á. Löve & D. Löve	
Poa ambigua (Pauquy) Mathieu	
Poa borreri (Bab.) Parnell	
Poa dalavarica Biroli ex Colla	
Poa delawarica Balb.	
Poa delawarica Link	

Poa fasciculata Torr.
Puccinellia borreri (Bab.) Hayek
Puccinellia borreri (Bab.) Hitchc.
Puccinellia conferta (Fr.) Ponert
Puccinellia distans var. *poiformis* Emb. & Maire
Puccinellia fasciculata var. *caespitosa* Allan & Jansen
Puccinellia fasciculata var. *fasciculata* (Torr.) E. P. Bicknell
Puccinellia fasciculata var. *novazelandica* Allan & Jansen
Puccinellia fasciculata ssp. *poiformis* (Emb. & Maire) Dobignard & Portal
Puccinellia fasciculata ssp. *pseudodistans* (Crép.) Kerguélen
Puccinellia fasciculata var. *pseudodistans* (Crép.) P. D.Sell
Puccinellia fasciculata ssp. *pungens* (Pau) W. E. Hughes
Puccinellia fasciculata var. *scott-thomsonii* (Allan & Jansen) Zotov
Puccinellia scott-thomsonii Allan & Jansen
Puccinellia flahaultii Ponert
Puccinellia permixta (Guss.) Parl.
Puccinellia poiformis (Emb. & Maire) Dobignard & Portal
Puccinellia pseudodistans (Crép.) Jansen & Wacht.
Puccinellia × *pseudoprocumbens* (Corb.) Wilmott
Puccinellia pungens (Pau) Paunero
Sclerochloa arenaria var. *fasciculata* (Torr.) A. Gray
Sclerochloa borreri (Bab.) Bab.
Sclerochloa multiculmis ssp. *borreri* (Bab.) Syme

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