Carex joorii

Cypress-swamp Sedge

Cyperaceae

Carex joorii by Mason Brock, 2017

***Carex joorii* 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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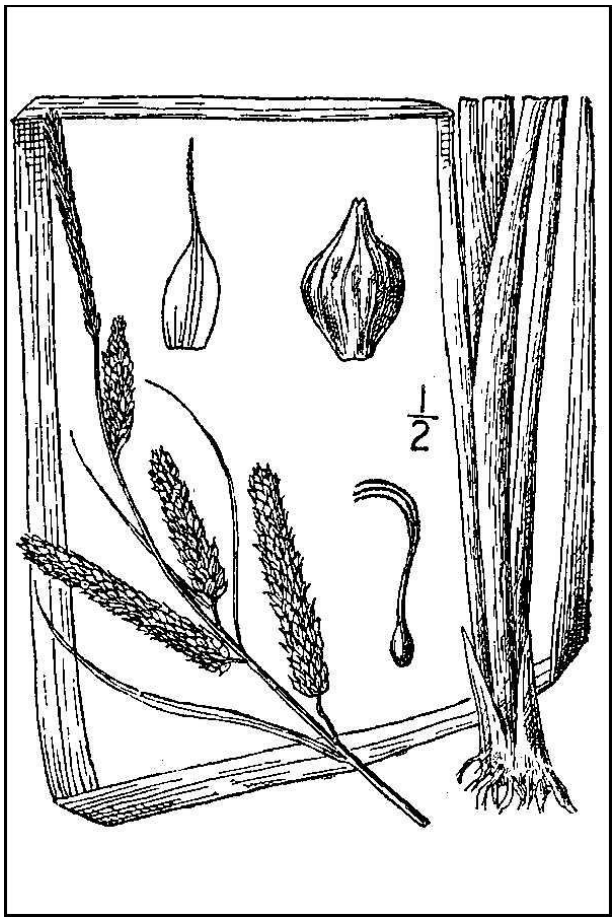
Life History

Carex joorii (Cypress-swamp Sedge) is a rhizomatous perennial sedge that usually grows in small to large clumps. The rhizomes are short and dark brown or black. The culms are stout and tall (up to 1.25 meters), sharply angled and rough on the upper margins, and reddish-purple at the base. The leaves are pale green, rough on the edges, 5–10 mm wide, and up to 120 cm long, tapering into long, narrow tips. The inflorescence of *C. joorii* has a staminate terminal spike and 3–6 pistillate spikes that often also have some staminate flowers at the tips. The pistillate spikes are cylindrical and densely flowered: They are borne on peduncles up to 6 cm long that may be erect or drooping. Both the staminate and pistillate spikes can range from 1.5–7 cm in length and their scales are awned. The perigynia are roundish in cross-section, have short beaks, and turn dark reddish-brown at maturity. The achenes are three-angled with concave sides. (See Bailey 1886, Britton and Brown 1913, Fernald 1950, Godfrey and Wooten 1981, Gleason and Cronquist 1991, McLaughlin 2004, Standley 2020).



Left: Britton and Brown 1913, courtesy USDA NRCS 2023a. Right: Larry Allain, USGS.

Carex joorii can flower and fruit from April to November (McLaughlin 2004) but June to October is typical (Weakley et al. 2022). A Virginia population observed by Fernald (1937) was just beginning to flower during the last week in July and had fruit by August. Fruiting culms have been observed on New Jersey plants from August through October (NJNHP 2022).

The large genus *Carex* has been divided into subsections and *C. joorii* has been placed in section *Glaucescentes* (Reznicek 2001). *C. joorii* is most similar to two other North American species with which it is closely allied, *C. glaucescens* and *C. verrucosa*, (Reznicek 2001, Standley 2020) but neither occurs in New Jersey (Kartesz 2015). *Carex joorii* may hybridize with other species in section *Glaucescentes*. Offspring of crosses between *C. joorii* and *C. verrucosa* appear to be infertile but some hybrids of *C. joorii* and *C. glaucescens* may be able to reproduce (McLaughlin 2004).

Pollinator Dynamics

Most species in the sedge family are pollinated by wind although there are a few notable exceptions in scattered genera, including *Carex* (Goetghebeur 1998, Yano et al. 2015). Some adaptations to wind pollination in the family include large anthers, long filaments, and prominent stigmas (Zomlefer 1994). It seems likely that or *Carex joorii* is pollinated by wind, although no explicit studies were found.

In nearly all sedges, the female flowers develop before the male flowers (protogyny) and the lowest flowers on a spike are the first to mature (Goetghebeur 1998). Both strategies are typically viewed as means of promoting cross-pollination. However, experimentation to test that assumption showed that protogyny was not a particularly effective way of guaranteeing outcrossing in *Carex*, and the species in the study displayed a high degree of self-compatibility (Friedman and Barrett 2009). The authors concluded that protogyny gives wind-pollinated *Carex* species an opportunity to cross-fertilize while self-pollination assures reproductive success.

Using pollen stainability as a means of assessing pollen viability, McLaughlin (2007) reported inconsistent results for *Carex joorii*, estimating a pollen viability range of 14–80%. If sexual reproduction is limited by low pollen viability the sedge may rely heavily on clonal growth to maintain populations.

Seed Dispersal

The fruit of a *Carex* plant is a single-seeded achene that forms in a sac-like perigynium in which it is eventually dispersed. A broad range of dispersal strategies have been reported in the genus, some of which were inferred from morphology (Leck and Schütz 2005, Newhouse et al. 1995). Żukowski et al. (2010) suggested that gravity was the primary dispersal mechanism for sedges, and gravity dispersal may be supplemented by wind in open environments (Nathan et al. 2008). Leck and Schütz (2005) reported that water dispersal was prevalent in the genus *Carex* and noted that the propagules of many species were capable of remaining afloat for extended periods. The fruits of various *Carex* species are consumed by game birds, songbirds, shorebirds and waterfowl as well as an assortment of mammals (Fassett 1957). A Texas study by Allen (1980) found that seeds of *Carex joorii* comprised approximately 5% of the late fall and winter diets of Mallards (*Anas platyrhynchos*) and Wood Ducks (*Aix sponsa*). Seed viability has been documented in a number of sedges that were dispersed by birds or hoofed mammals (Leck and Schütz 2005).

Information is lacking regarding germination and establishment in *Carex joorii*. The majority of sedges are persistent in the seed bank, and in other species of *Carex* larger seed sizes have been associated with longer dormancy and more successful germination (Leck and Schütz 2005). Singer (2001) documented seed banking in the closely related *C. glaucescens*. The propagules of most *Carex* species require a period of stratification at either low or high temperatures (Żukowski et al. (2010) as well as sufficient light (Leck and Schütz 2005) in order to germinate. *Carex* seeds typically sprout underground, producing their first leaf 4–5 days after germination (Alexeev 1988). It is not clear whether *Carex joorii* forms any fungal associations, as no reports of mycorrhizae were found for species in section *Glaucescentes*.

Habitat

Carex joorii grows in wet places such as swamps, bottomlands, and marshy shorelines at elevations up to 800 meters above sea level (Fernald 1937, Godfrey and Wooten 1981, Standley 2020, Weakley et al. 2022). Populations have been associated with spring seeps, backwater sloughs, seasonal ponds, wet meadows, and ruderal wetlands (Fry and Lea 2001, McAvoy and Bowman 2002, Majure 2007, Naczi and Ford 2008, Evans et al. 2016). The sedge has also been recorded in disturbed sites including logged pine plantations and roadside ditches (Medley et al. 1983, McLaughlin 2004). In New Jersey, *C. joorii* was initially found in an excavated ditch that passed through a series of wet swales adjacent to a stream, and the sedge subsequently colonized some nearby mud flats (Snyder 1994, NJNHP 2022).

Carex joorii can grow in sandy, loamy, or clay soils (McLaughlin 2004). It often favors acidic substrates (Naczi et al. 2020), a trait it shares with other North American species in section *Glaucescentes* (Reznicek 2001). The sites where the sedge occurs are typically lightly to moderately shaded and the plants are often situated along edges or within small gaps in forested sites (Alford 2001, Naczi et al. 2020). Places where Cypress-swamp Sedge grows are generally saturated or inundated for several months during the year (Wofford et al. 1979, Majure 2007, Naczi et al. 2020, Standley 2020, Bauer and Campbell 2022). Water flow rates are typically low (Sorrie et al. 2006). A study of riverine bottomland hardwood forests in Florida found that *C. joorii* was present in sites which were flooded for 2–7 months out of the year and remained saturated for another month but absent from sites that remained saturated year-round and inundated for up to 9 months (Darst et al. 2002). Thurman (2016) found that *C. joorii* grew at sites that were inundated about 40% of the time, recording average water depths of 0.1 meter and maximum depths of 0.4 meter.

As the name Cypress-swamp Sedge suggests, *Carex joorii* often occurs in communities where either Bald Cypress (*Taxodium distichum*) or Pond Cypress (*T. ascendens*) make up a significant portion of the canopy (Ward and Clewell 1989, Carter et al. 1990, Darst et al. 2002, Sorrie et al. 2006). However, it can also be found in communities where deciduous trees such as *Liquidambar styraciflua*, *Acer rubrum*, and *Nyssa* spp. are prevalent (Breden et al. 2001, Evans et al. 2016). Witsell (2007) observed *C. joorii* growing along the margins of open ponds where the canopy was limited to scattered *Cephalanthus occidentalis* shrubs. *Carex joorii* is also a characteristic component of several globally rare vegetation associations including *Liquidambar styraciflua - Acer rubrum - Nyssa biflora* / *Carex joorii* Forest, *Quercus phellos* / *Carex*

(*albolutescens, intumescens, joorii*) / *Climacium americanum* Forest, and *Carex joorii* - *Eleocharis tenuis* var. *verrucosa* - *Juncus* spp. - *Panicum rigidulum* Interior Highlands Channel Scar Depression Wooded Marsh (Largay and Sneddon 2009, Witsell 2012, Harrison 2016).

Wetland Indicator Status

Carex joorii 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 2023b)

CAJO2

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 *Carex joorii* is restricted to the southeastern United States (POWO 2023). The map in Figure 1 depicts the extent of the species in North America.

The USDA PLANTS Database (2023b) shows records of *Carex joorii* in one New Jersey county: Cape May County (Figure 2). The map reflects the current known distribution of Cypress-swamp Sedge in the state.

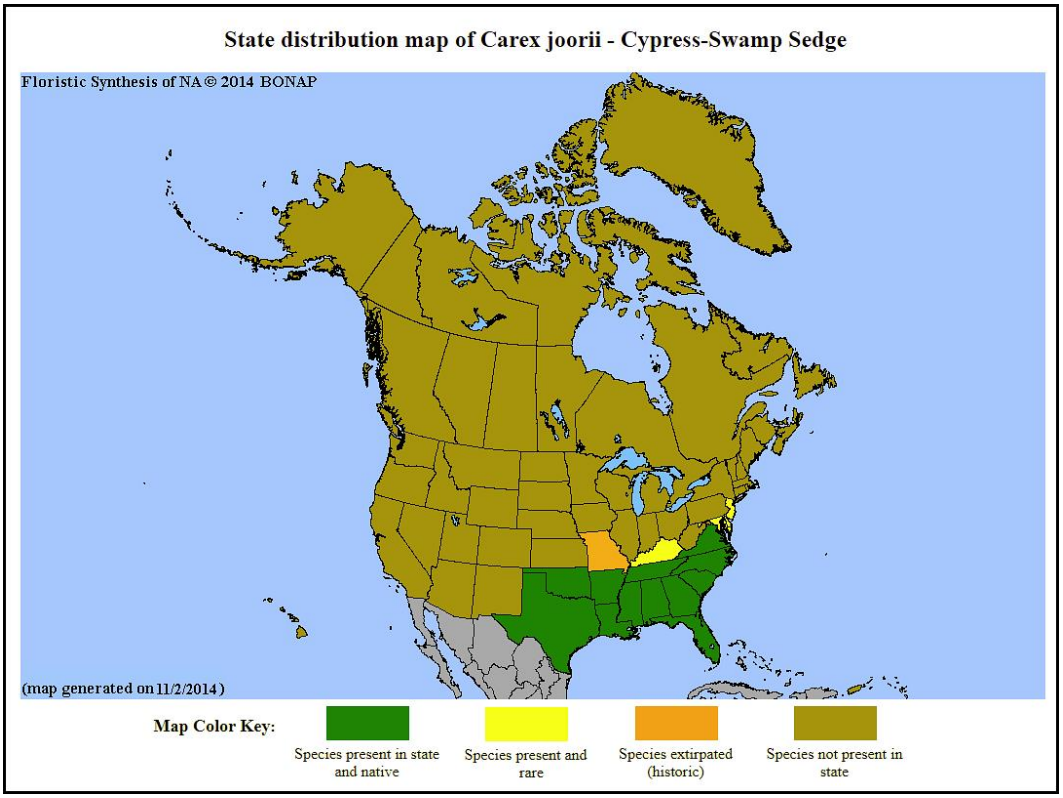


Figure 1. Distribution of C. joorii in North America, adapted from BONAP (Kartesz 2015).

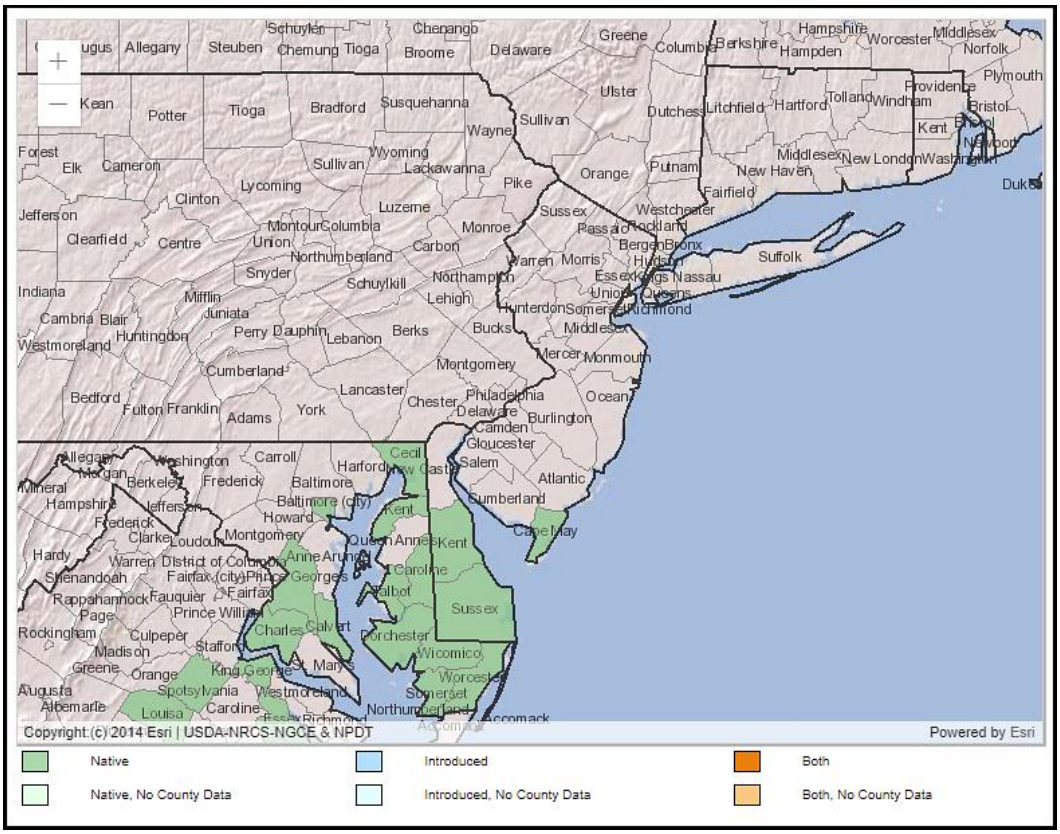


Figure 2. County records of C. joorii in New Jersey and vicinity (USDA NRCS 2023b).

Conservation Status

Carex joorii has a global rank of G4G5, meaning there is some uncertainty as to whether it should be considered apparently secure or secure. A G4 species has a fairly low risk of extinction or collapse due to an extensive range and/or many populations or occurrences, although there is some cause for concern as a result of local recent 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 2023).

The map below (Figure 3) illustrates the conservation status of *Carex joorii* throughout its range. The sedge 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 two states, and possibly extirpated in Missouri. *C. joorii* is secure, apparently secure, or unranked in other states where it has been reported.

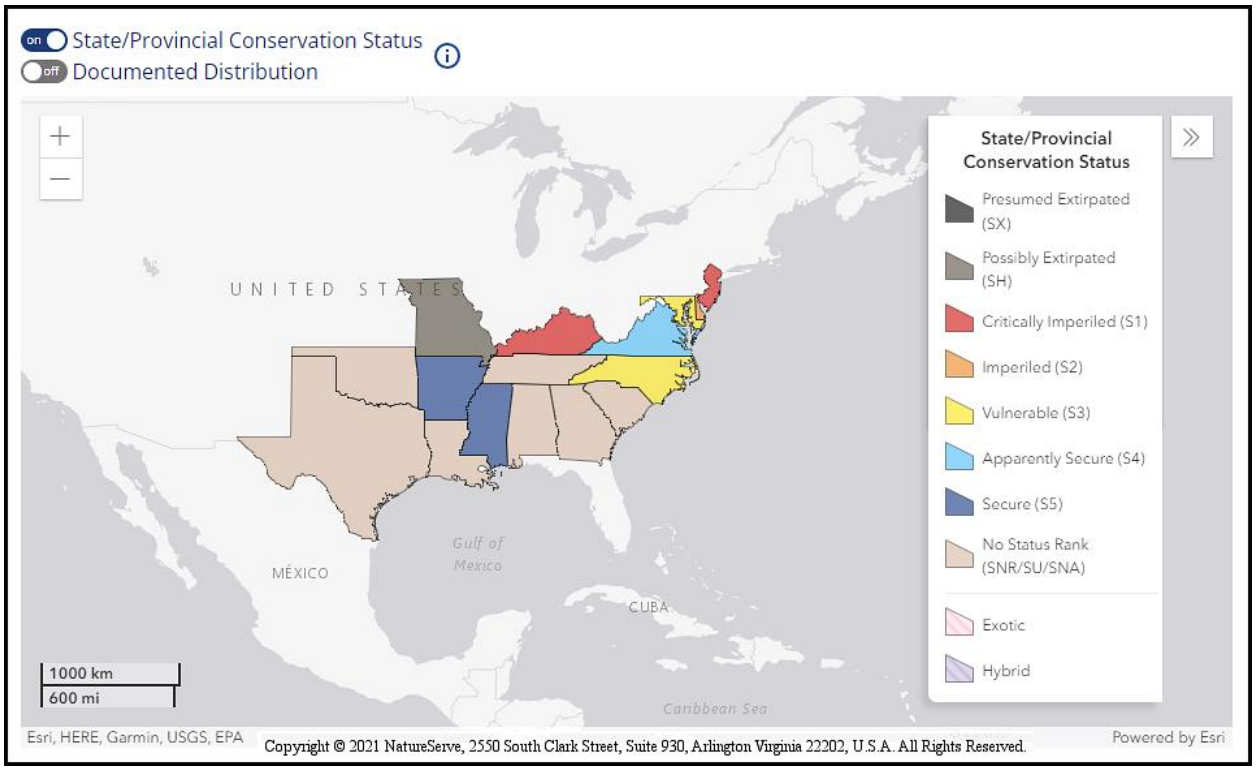


Figure 3. Conservation status of C. joorii in North America (NatureServe 2023).

Carex joorii is ranked S1.1 in New Jersey (NJNHP 2022), meaning that it is critically imperiled due to extreme rarity. A species with an S1.1 rank has only ever been documented at a single location in the state. *C. joorii* 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 sedge 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).

Carex joorii was first documented in New Jersey in 1991 by David Snyder and Andrew Windisch. Snyder (1994) noted that the sedge had recently been reported in Delaware and appeared to be expanding its range northward. Although the original population has decreased in size since the initial discovery, two new colonies were found nearby during subsequent monitoring visits (NJNHP 2022).

Threats

Although New Jersey's population of *Carex joorii* is situated in a disturbed habitat, no direct threats to the established plants were noted (NJNHP 2022). Many populations of Cypress-swamp Sedge in other locations are at risk of habitat loss or fragmentation (NatureServe 2023). Occurrences associated with intermittent ponds on the coastal plain are especially likely to have experienced habitat degradation or destruction as a result of agricultural activities or timber harvesting practices (McAvoy and Bowman 2002).

Carex joorii seems to be a species that does not benefit from fire, although the topic has not been thoroughly explored. One Florida community where the sedge occurred was described as "fire-intolerant" (Ward and Clewell 1989), and a Texas occurrence was reduced following a prescribed burn (Rideout and Oswald 2002). However, Rideout and Oswald noted that effects from a prolonged drought may have contributed to the decline of the *C. joorii* population.

Rising temperatures and shifting precipitation patterns are bringing about more frequent and intense droughts in New Jersey, along with unpredictable flooding events and higher salinity levels in wetlands near the coast (Hill et al. 2020). Available information indicates that *Carex joorii* would be intolerant of salinity (Darst et al. 2002), although the New Jersey population does not appear to face any short-term threats from salt water intrusion (Lacombe and Carleton 2002, NJ Adapt 2023). The occurrence may be at greater risk from potential changes in local hydrologic patterns that result in lengthy droughts or floods. While *C. joorii* can tolerate moderate periods of inundation it evidently requires intervals of drawdown in order to persist and thrive (Darst et al. 2002, Thurman 2016).

Management Summary and Recommendations

No specific management needs have been identified for New Jersey's extant occurrence of *Carex joorii*. Surveys of potential habitat in the vicinity of that population and other known occurrences near the northern end of the sedge's range might help to determine whether the species is in the process of expanding its reach. Some populations of Cypress-swamp Sedge could probably benefit from habitat preservation activities (eg. land protection, buffer establishment), particularly those associated with small or isolated intermittent ponds—habitats which are particularly sensitive to changes in their hydrologic regimes (Johnson and Walz 2013)

and historically have not enjoyed the same legal protections as riparian or lacustrine wetlands (Kirkman et al. 1999).

Additional research is needed in order to effectively plan for the conservation of *Carex joorii* in states where it is vulnerable or imperiled. Information is lacking regarding the sedge's germination and establishment requirements. McLaughlin (2004) recommended further study to determine how much the reproduction of *C. joorii* may be limited by poor pollen viability and whether the species can produce viable propagules without fertilization. More data on fire impacts would be helpful, and studies of possible fungal associations or competitive interactions with other plants might also yield valuable information.

Synonyms

The accepted botanical name of the species is *Carex joorii* L. H. Bailey. Orthographic variants, synonyms, and common names are listed below (ITIS 2021, POWO 2023, USDA NRCS 2023b).

Botanical Synonyms	Common Names
	Cypress-swamp Sedge
	Hummock Sedge
	Joor's Sedge

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