

# *Carex arctata*

**Drooping Wood Sedge**

**Cyperaceae**



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*Carex arctata* by Peter M. Dziuk, 2012

## ***Carex arctata* 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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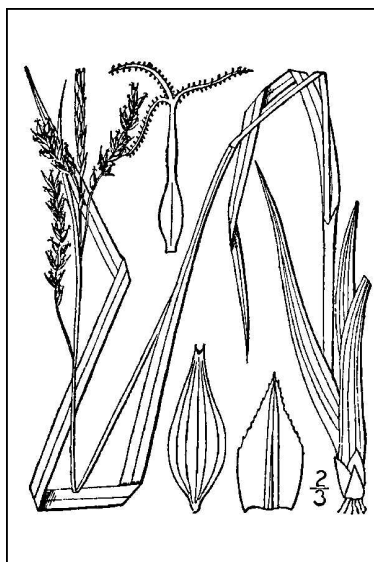
March, 2024

For:  
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This report should be cited as follows: Dodds, Jill S. 2024. *Carex arctata* 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, Trenton, NJ. 17 pp.

## Life History

*Carex arctata* (Drooping Wood Sedge) is a rhizomatous perennial herb in the Cyperaceae. The plants form dense clumps that may include both flowering and vegetative shoots. *Carex* is a large genus that has been divided into subgroups and *C. arctata* was placed in section Hymenochlaenae. Sedges in that section have leaves that are M-shaped in cross-section when young, narrow spikes on long peduncles that often nod or droop, and pistillate flowers with three stigmas and deciduous styles (Arsenault et al. 2013, Waterway 2020). The basal leaves of plants in the Hymenochlaenae often persist through the winter (Waterway 2020). *Carex arctata* typically blooms in the spring and fruits may be present from late spring through mid-summer (Riley et al. 1981, Waterway 2020). Clausen (1945) observed *C. arctata* plants in Ithaca, New York dispersing pollen as early as April 15 during the exceptionally warm spring of 1945, and mature fruits were collected from the species during late June of 1966 in Quebec (Bond 1999). In New Jersey, fruiting culms have typically been found from mid-May through mid-June and some fruits may still be present through late July (NJNHP 2024). The seasonal shoots of Drooping Wood Sedge do not continue to elongate after the plants have flowered (Kempe et al. 2013).



Left: Britton and Brown 1913, courtesy USDA NRCS 2024a. Center and Right: Peter M. Dziuk 2012 and 2015.

*Carex arctata* has maroon coloration at the bases of both leaf sheaths and culms. The leaves are firm, dark green, and smooth—although they are slightly rough along the margins—and they can be up to 10 mm wide on vegetative shoots but are typically narrower on reproductive shoots. The slender flowering culms are much longer than the leaves, reaching heights of up to a meter. The terminal spike is staminate and up to 28 mm in length. Two to five lateral pistillate spikes are also present, each 2.5–8 cm long, 3–4 mm wide, and bearing 15–45 perigynia. The lateral spikes are initially erect but shortly begin to droop. The pale pistillate scales have a dark midrib and often end in a sharp tip or a short awn. Three stigmas are present on the pistillate florets and the perigynia are 3–5 mm long, tapering to a minute beak with two teeth: They have 10–15 fine veins between the two distinct ribs and may be red-dotted. The achenes are sessile, 1.7–2.6 mm

long, and 0.8–1.7 mm wide. (See Britton and Brown 1913, Fernald 1950, Gleason and Cronquist 1991, Rhoads and Block 2007, Arsenault et al. 2013, Waterway 2020). Some *C. arctata* plants have shorter, more densely-flowered pistillate spikes than the typical plants: Those were described as a distinct variety (var. *faxonii*) by Bailey (1988) but the form may occur on late-flowering individuals in any population (Waterway 2020).

In addition to *Carex arctata* there are seven other species from *Carex* section Hymenochlaenae in New Jersey (Kartesz 2015). *C. arctata* can be distinguished from those similar species by the combination of the staminate terminal spike, the lance-shaped, short-beaked, veined perigynia, the absence of a stipe at the achene base, and the maroon leaf bases (Waterway 2020). *Carex castanea* is not found in New Jersey but where that species co-occurs with *C. arctata* they occasionally hybridize and the offspring (*C. ×knieskernii*) may be confused with *C. arctata*. Reports of hybridization between *C. arctata* and other species have either been dismissed or remain unconfirmed (Bill 1930, Smith et al. 2008, Waterway 2020).

### **Pollinator Dynamics**

Most species in the sedge family are pollinated by wind although there are a few 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). *Carex arctata* was one of the sedges used by Friedman and Barrett (2011) to demonstrate the benefits of minimal investment in ovule production for wind-pollinated species.

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—which included *C. arctata*—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.

### **Seed Dispersal and Establishment**

The fruit of a *Carex* plant is an achene that forms in a sac-like perigynium in which it is eventually dispersed. Hughes and Fahey (1991) studied dispersal and colonization by germinating seeds from forest soils and found that the majority of *C. arctata* propagules (about 90%) were located within two meters of a mature plant. Examination of the mechanical role of leaf sheaths in *C. arctata* and other graminoid species indicated that the sheaths help to maintain stability and prevent culm breakage, maximizing the potential range for local seed dispersal (Kempe et al. 2013). Wind may increase local dispersal distances in more open habitats (Nathan et al. 2008). Reed (1985) suspected that small mammals played a significant role in the movement of *Carex arctata* seeds at an Indiana site based on the frequent establishment of the sedge above burrows.

Comprehensive botanical surveys which documented an apparently new occurrence of *Carex arctata* on an island in a New Hampshire lake where it had not previously been seen (Holland and Sorrie 1989) suggest that the seeds are sometimes transported farther. Distribution over longer distances is likely to be facilitated by animals. The fruits of various *Carex* species are consumed by an assortment of birds and mammals (Fassett 1957) and seed viability has been documented in a number of sedges that were dispersed by birds or hoofed mammals, including White-tailed Deer (*Odocoileus virginianus*) (Myers et al. 2004, Leck and Schütz 2005).

Seed banking has been documented in *C. arctata* (Leck and Schütz 2005), although no information was found regarding long-term seed bank persistence in the species. A study by Leckie et al. (2000) found viable *Carex arctata* seeds in densities up to 225 per square meter, but the authors pointed out that they might have been produced during the previous growing season. *Carex arctata* seeds are generally dormant during the winter months and germinate during May (Bond 1999). Bond's work demonstrated that germination in *C. arctata* was significantly enhanced by light. *Carex* seeds typically sprout underground, producing their first leaf 4–5 days after germination (Alexeev 1988). It is not clear whether *Carex arctata* forms any fungal associations: Only two of the 20 species listed in section Hymenochlaenae by Waterway (2020) appear to have been examined for fungal associates and both were reported as non-mycorrhizal (Wang and Qiu 2006).

## **Habitat**

As suggested by its common name, Drooping Wood Sedge is often found in forested sites. The canopy may be composed of deciduous, evergreen, or mixed woody species (Riley et al. 1981, Arsenault et al. 2013, Waterway 2020, Weakley et al. 2022). Although *Carex arctata* is generally considered an upland plant (see next section) it is often found in mesic or moist sites, and the sedge has also been reported in a variety of lowland habitats (Roberts and Gilliam 1995, Bond 1999, Rhoads and Block 2007, Waterway 2020). Both of New Jersey's extant occurrences are located in moist woods (NJNHP 2024). Harper (1900, 1918) found that *C. arctata* favored rich woodlands in New England and in Michigan, Weatherby (1942) indicated that it occupied similar habitat in Nova Scotia, and Nichols (1913) suggested that the species was restricted to upland woods. A review of historical collections from one New York county noted that specimens of *C. arctata* had originated in both beech (*Fagus grandifolia*) woods and swampy woods (Kelloff and Kass 2018). Hermann (1941) observed that while Michigan populations of the sedge were most often found in moist or dry sandy woods it also occasionally occurred in bogs or swamps, and one collection of *C. arctata* was made in an open swale at the end of a Maine lake (Allard and Leonard 1945). When *Carex arctata* occurred in an upland forest dominated by *Pinus strobus*, *Acer saccharum*, and *Tilia americana*, the sedge was restricted to the wetter microsites within the habitat (Peet 1984). Conflicting results were reported from other microsite studies: Hagen et al. (2006) found that the sedge was more likely to be abundant in close proximity to a stream bank but Goebel et al. (2006, 2012) indicated that *C. arctata* was more often found on terraces than in floodplains and became more abundant at greater distances from a stream channel.

Humbert et al. (2007) classified *Carex arctata* as a shade tolerant species, assigning it a rank of 3 on an index ranging from 1 (very tolerant) and 9 (very intolerant). Hughes and Fahey (1991) suggested that *C. arctata* utilized a life history strategy that corresponded well to the one described by Grime (1977) for stress-tolerant plants—maintaining small but stable populations for long periods at undisturbed sites but capable of expanding rapidly in response to increased light availability. Their supposition is supported by observations from other studies and habitat records. *Carex arctata* can sometimes be found in clearings (Rhoads and Block 2007) and had a notable presence at sites that were previously utilized for agriculture or forest plantations (Gachet et al. 2007). *C. arctata* has been associated with small-scale disturbances within forests, occurring along trailsides and ditches or on windthrow mounds (Reed 1985), and it has been known to significantly increase in abundance immediately following canopy removal (Reiners 1992, Dech et al 2008). The sedge may also be tolerant of occasional burning, as it has been found in areas with fire scars (Reed 1985). Reiners (1992) noted that the sedge became less plentiful over a twenty-year period as succession proceeded but continued to persist. *C. arctata* maintained a strong presence in a second growth forest that had experienced minimal disturbance for a half century (Riemenschneider and Reed 1985) and was recorded as a component of the herb layer in an old-growth forest in Connecticut (Nichols 1913).

### **Wetland Indicator Status**

*Carex arctata* 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 2024b)**

CAAR3

### **Coefficient of Conservancy (Walz et al. 2020)**

CoC = 10. 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 distribution of *Carex arctata* is restricted to the central and eastern United States and Canada (POWO 2024). The map in Figure 1 depicts the extent of the species in North America.

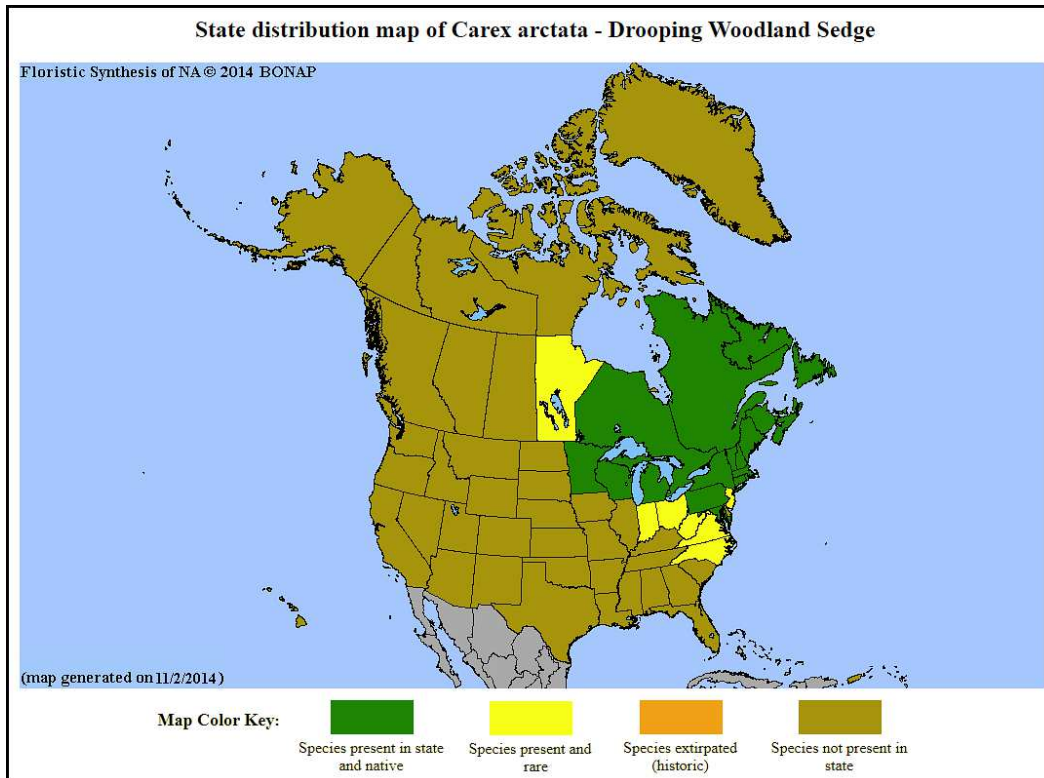


Figure 1. Distribution of *C. arctata* in North America, adapted from BONAP (Kartesz 2015).

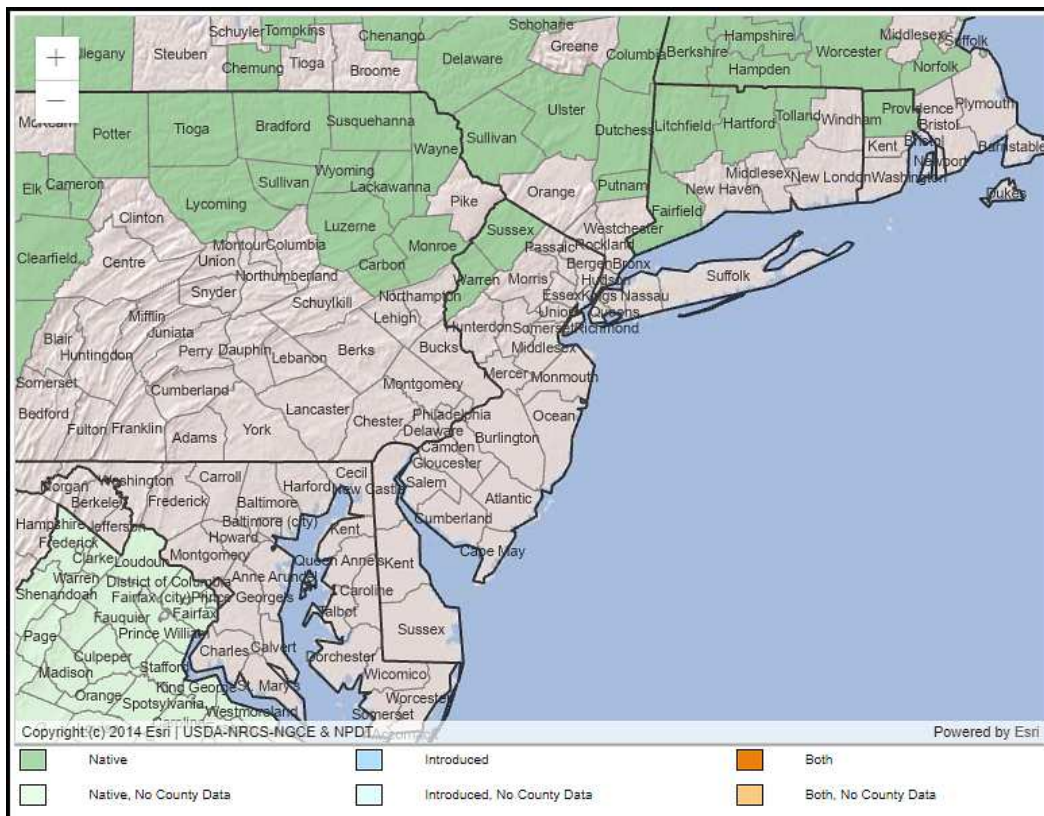


Figure 2. County records of *C. arctata* in New Jersey and vicinity (USDA NRCS 2024b).

The USDA PLANTS Database (2024b) shows records of *Carex arctata* in two New Jersey counties: Sussex and Warren (Figure 2 above). Collections of the sedge have also been reported from Burlington, Camden, Cape May, Essex, Gloucester, Mercer, and Ocean counties (Mid-Atlantic Herbaria 2024). The data include historic observations and do not reflect the current distribution of the species.

### Conservation Status

*Carex arctata* 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 2024). The map below (Figure 3) illustrates the conservation status of *C. arctata* throughout its range. Drooping Wood Sedge is imperiled (high risk of extinction) in one state and critically imperiled (very high risk of extinction) in five states and one province. Throughout most of its range the sedge is secure, apparently secure, or unranked.

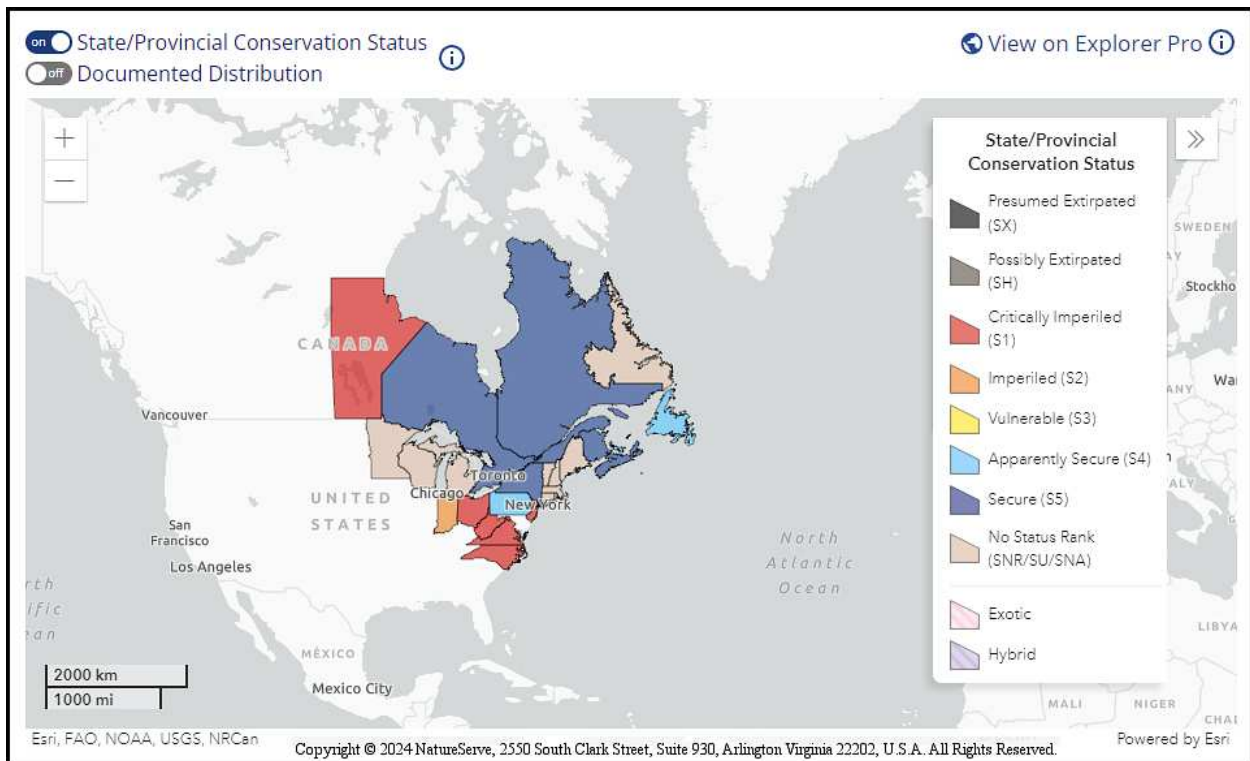


Figure 3. Conservation status of *C. arctata* in North America (NatureServe 2024).

New Jersey is one of the states where *Carex arctata* is critically imperiled (NJNJP 2024). 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. *C. arctata* 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).

The earliest reports of *Carex arctata* in New Jersey were from Bergen, Essex, and Gloucester counties (Willis 1877, Britton 1889, Keller and Brown 1905) but the records were subsequently called into doubt (Taylor 1915, Hough 1983, Lamont et al. 2011). Only two verified occurrences are presently tracked by the Natural Heritage Program and they are situated in Sussex County. Both populations were small when first discovered during the 1990s: One was not found when the site was last searched and the other was noted to be declining for no apparent reason (NJNHP 2024).

### **Threats**

As previously discussed, *Carex arctata* can persist in the same location for lengthy periods, tolerating shaded conditions and boosting reproduction by seed in response to canopy disturbance. It is not clear why New Jersey's populations have fared so poorly since the habitat conditions appeared to be suitable and no invasive species were noted during past surveys. Herbivory by deer poses a significant threat to many of New Jersey's rare plants but that may not be a problem for *Carex arctata*. Plants that are able to regrow from a basal meristem after they have been browsed have reduced susceptibility to herbivores (Begley-Miller 2014), and secondary impacts such as soil compaction or increased light availability resulting from the removal of other vegetation can be beneficial to graminoid species (Sabo et al. 2017). One potential threat that might not be evident during a vegetative survey is the presence of non-native earthworms. The introduced worms reduce the organic layer, alter the structure and nutrient cycling patterns of the soils, and disrupt fungal communities (Bohlen et al. 2004, Frelich et al. 2006, Hale et al. 2006). *Carex arctata* was identified as a species that is more likely to be found at sites with low earthworm density (Corio et al. 2009).

*Carex arctata* is a host species for a leaf spot fungus, *Cercospora caricina* (Lieneman 1929). Spores from a rust fungus (*Puccinia grossulariae*) that uses *Ribes* species as an alternate host have also been collected on *C. arctata* (Fraser 1912, Arthur 1915). Fungal diseases can reduce reproduction or increase mortality, particularly when infections are intense or plant vigor has been depleted by other factors (Kranz 1990).

### **Climate Change Vulnerability**

Information from the references cited in this profile was used to evaluate the vulnerability of New Jersey's *Carex arctata* 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 state climactic computations by Ring et al. (2013). Based on available data *C. arctata* was assessed as Less Vulnerable, meaning that climate change is not expected to have a notable detrimental impact on

its extent in New Jersey by 2050. However, the conclusion was reached with a low level of confidence due to gaps in information regarding the species' ecological requirements.

Aldrich et al. (1986) characterized *Carex arctata* as a species of boreal affinities, and the map of its conservation status (Figure 3) indicates that the sedge is most likely to be identified as imperiled at the southern end of its range. Changing climactic conditions are causing temperatures to rise rapidly in New Jersey, resulting in lower levels of soil moisture during the growing season (Hill et al. 2020). As forest soils become dryer the habitats may be less suitable for species like *C. arctata*. The sedge's seemingly low rate of long-distance dispersal and New Jersey's highly developed landscape are likely to reduce opportunities for the colonization of new sites in the state if existing locations become unsatisfactory.

### **Management Summary and Recommendations**

New Jersey's two documented populations of *Carex arctata* appear to be situated in favorable habitat and no particular threats have been noted (NJNHP 2024). However, both occurrences are growing beneath a well-established canopy and may be reliant on clonal reproduction in order to persist. It is possible that the creation of a small gap which allows more light to reach the ground could stimulate flowering or trigger the germination of buried seeds. However, care should be taken to avoid large canopy disturbances that might favor the growth of other species since the competitive abilities of *C. arctata* are unknown.

Other polycarpic perennial plants that establish from seed in the spring typically require a period of stratification at low temperatures in order to germinate (Baskin and Baskin 1988). If that is the case for *Carex arctata*, rising temperatures could be detrimental to populations situated near the southern end of the species' range. Research that sheds light on whether the climate has played a role in shaping the past and present distribution of *C. arctata* would help to determine whether an investment in protecting marginal populations is warranted. Additional information regarding the sedge's competitive abilities or potentially beneficial fungal associations would also be useful.

Populations of plants that are situated on the periphery of a species' range may be more vulnerable but they can also be better adapted to local conditions, making their conservation particularly important (Bahn et al. 2006, Rehm et al. 2015). Regular monitoring of the New Jersey's *Carex arctata* occurrences is recommended in order to identify emerging threats, assess changes in status, and determine whether intervention is needed to increase the probability that the populations will persist.

### **Synonyms**

The accepted botanical name of the species is *Carex arctata* Boott ex Hook. Orthographic variants, synonyms, and common names are listed below (ITIS 2024, POWO 2024, USDA NRCS 2024b).

## Botanical Synonyms

*Carex arctata* var. *faxonii* L. H. Bailey

## Common Names

Drooping Wood Sedge  
Drooping Woodland Sedge  
Black Sedge

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