Carex copulata

Coupled Sedge

Cyperaceae

Carex copulata by Brian Miller, 2023

***Carex copulata* 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

501 E. State St.
PO Box 420
Trenton, NJ 08625-0420

Prepared by:
Jill S. Dodds
jsdodds@biostarassociates.com

July, 2025

For:
New Jersey Department of Environmental Protection
Office of Natural Lands Management
New Jersey Natural Heritage Program
natlands@dep.nj.gov

This report should be cited as follows: Dodds. Jill S. 2025. *Carex copulata* 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. 16 pp.

Life History

Carex copulata (Coupled Sedge) is a rhizomatous perennial sedge in *Carex* Section Careyanae. The group includes sedges with staminate terminal spikes and loosely-flowered carpellate spikes bearing three-sided, distinctly veined perigynia that taper at both ends and terminate in short beaks (Naczi et al. 2001, Arsenault et al. 2013, Bryson and Naczi 2020). Coupled Sedge is widely, but not universally, viewed as a variety of *Carex laxiculmis* (see Synonyms and Taxonomy section).

Carex copulata grows in dense tufts. The leaves are bright green and 8–36 cm long, with the widest being 5.3–8.3 mm wide. The flowering culms are purple or brown at the base, slender, sharply triangular, and 9–48 cm tall. The stems generally exceed the leaves in length although they often lean sideways. The terminal spike on each culm is staminate, and the larger staminate spikes are 6–20 mm long and 2–3 mm wide. The 2–4 lateral spikes are 5–20 mm long and 4–5 mm wide: They are mainly pistillate but the lowest scale is either empty or contains a staminate floret. Pistillate flowers of *C. copulata* have three stigmas. The achenes are brownish with three concave sides, 2.2–3.2 mm long by 1.2–1.8 mm wide, and fit snugly in the perigynia. (See Mackenzie 1935, Bryson and Naczi 2020).

Left: Hattie J. Stimmel, 1898. Center: Michael J. Oldham, 1987. Right: Brian Miller, 2023.

Five other sedges in Section Careyanae occur in New Jersey, but *Carex copulata* is most likely to be confused with *C. digitalis* or *C. laxiculmis*. *Carex digitalis* has pistillate flowers in the lowest scales of the lateral spikes and narrower leaves (widest 2.7–4.5 mm). The leaves of *C. laxiculmis* have a waxy coating that makes them look whitish and they are a little wider (widest 6.4–11.8 mm), while the staminate spikes are a little longer (longest 12–25 mm) in comparison to those of *C. copulata* (Bailey 1889, Cratty 1898, Hermann 1941, Naczi et al. 2001, Ladd and Thomas 2015, Bryson and Naczi 2020).

Like most *Carex* species, *C. copulata* can reproduce clonally. The individual ramets of many species in Section Careyanae, including *C. copulata*, form two types of buds: The primary bud produces a central leafy shoot while lateral buds that develop in the leaf axils can become

flowering stems (Holm 1896, Reznicek and Catling 1986, Bernard 1990). *Carex copulata* usually flowers in the spring and fruits early in the summer (Bryson and Naczi 2020, Weakley et al. 2024). Historically, plants in the northeast have been found in fruit from early June through early July (Knowlton et al. 1912, Mackenzie 1917, Clausen and Wahl 1939). During recent years, *C. copulata* plants in New Jersey populations displayed mature fruit in early June and by the end of the month the fruits were falling from the stems (NJNHP 2024).

Pollinator Dynamics

Carex plants are wind-pollinated and self-compatibility is common in the genus, although the probability of cross-fertilization is enhanced by the female flowers becoming receptive before staminate flowers on the same plant release their pollen (protogyny). Typical adaptations to wind pollination in the sedge family include large anthers, long filaments, and prominent stigmas. Incidental cross-fertilization may occasionally result from the visits of beetles or bees (Tucker 1987, Zomlefer 1994, Goetghebeur 1998, Bertin 2007).

Research by Friedman and Barrett (2009) indicated that protogyny was not a particularly effective way of guaranteeing outcrossing in *Carex*, and the species in their study displayed a high degree of self-compatibility. The authors concluded that protogyny gives wind-pollinated Carices an opportunity to cross-fertilize while self-pollination assures reproductive success. Experimental self-fertilization resulted in high levels of seed set for two other sedges in Section Careyanae (Handel 1978a).

Seed Dispersal and Establishment

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 variety of distribution mechanisms have been reported in the genus (Leck and Schütz 2005). Gravity is the primary dispersal strategy for sedges (Żukowski et al. 2010) but animal-mediated dispersal may also occur. The fruits of various *Carex* species are consumed by game birds, songbirds, shorebirds and waterfowl as well as an assortment of mammals (Fassett 1957), and some sedge seeds retrieved from the droppings of birds or hoofed mammals have proven to be viable (Myers et al. 2004, Leck and Schütz 2005).

Myrmecochory, or dispersal by ants, is a strategy that is utilized by a number of woodland sedges (Swearingen 2021). Ants are attracted by seed appendages known as elaiosomes that are rich in fatty acids and diglycerides. They carry the propagules back to their nests, where they consume the appendages while leaving the seeds intact (Heithaus 1981). Beattie and Culver (1981) reported ant dispersal in the closely related *Carex laxiculmis*, noting the presence of elaiosomes and prostrate stems. Their West Virginia study documented a 58% seed removal rate by two species of *Aphaenogaster*. When Gaddy (1986) included *C. laxiculmis* in a South Carolina evaluation they indicated that the species had "very small elaiosome-like structures" and only recorded an 8% seed removal rate. Some sedges and other understory plants utilize myrmecochory as a secondary dispersal strategy so its importance might vary depending on local circumstances (Warren et al. 2021).

Carex copulata probably forms a seed bank. Seed banking has been documented in a number of closely related species including *C. laxiculmis*, *C. digitalis*, *C. plantaginea*, and *C. platyphylla* (Leck and Leck 2005, Leck and Schütz 2005). 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 plantaginea* and *C. platyphylla* benefit from a period of cool, moist stratification but even then both species germinate at a fairly low rate (Handel 1978b, Bond 1999). *Carex* seeds typically sprout underground, producing their first leaf 4–5 days after germination (Alexeev 1988). It is not clear whether *C. copulata* and its near relatives form mycorrhizal associations as the seedlings develop.

Habitat

Carex copulata is highly shade-tolerant species that is usually found in moist to dry forested sites (Mackenzie 1935, Clausen and Wahl 1939, Hermann 1941, Terrell 1955, Ladd and Thomas 2015, Slaughter 2020, Weakley et al. 2024). The sedge can grow in low lying floodplains or on upland slopes, occurring at elevations that range from 0–1000 meters above sea level (Cratty 1898, Fernald 1942, Wheeler and Ownbey 1984, Hyatt 1998a & 1998b, Lea and Frye 2002, Slaughter and Klain 2019, Bryson and Naczi 2020, Landsman et al. 2024). The established forests where *Carex copulata* grows are usually dominated by deciduous trees, although some evergreen species may also be present in the mix. Typical canopy species can include *Acer saccharum*, *Fagus grandifolia*, *Fraxinus americana*, *Juglans* spp., *Liriodendron tulipifera*, *Quercus* spp., *Tilia americana,* or *Ulmus americana*. The herb layer may be sparse or rich but it is likely to include other *Carex* species, ferns, and an assortment of forbs (Poindexter 2006 & 2013, Bryson and Naczi 2020, Fessler 2025).

Carex copulata has a strong affinity for calcareous substrates (Mackenzie 1935, Lea and Frye 2002, Rhoads and Block 2007, Naczi et al. 2020). Documented occurrences in New Jersey have been restricted to wooded limestone slopes in the northern part of the state (Mackenzie 1917, NJNHP 2024). Although Coupled Sedge seems to be rare at disturbed sites, McFadden (2018) collected it from an abandoned limestone quarry in Kentucky.

Wetland Indicator Status

Carex copulata and *C. laxiculmis* are 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 2022).

USDA Plants Code (USDA, NRCS 2025)

The USDA code for *Carex copulata* is CACO53. The USDA lists it as *Carex laxiculmis* var. *copulata*, code CALAC.

Coefficient of Conservancy (Walz et al. 2020)

CoC = 5. Criteria for a value of 3 to 5: Native with an intermediate range of ecological tolerances and may typify a stable native community, but may also persist under some anthropogenic disturbance (Faber-Langendoen 2018).

Distribution and Range

The global range of *Carex copulata* is restricted to central and eastern North America (POWO 2025). The map in Figure 1 depicts the extent of the species in the United States. Coupled Sedge reaches its southern limit in Jackson County, Alabama (Naczi et al. 2020). It also occurs in Ontario. *Carex copulata* has only been documented in one New Jersey county: Sussex County (Figure 2).

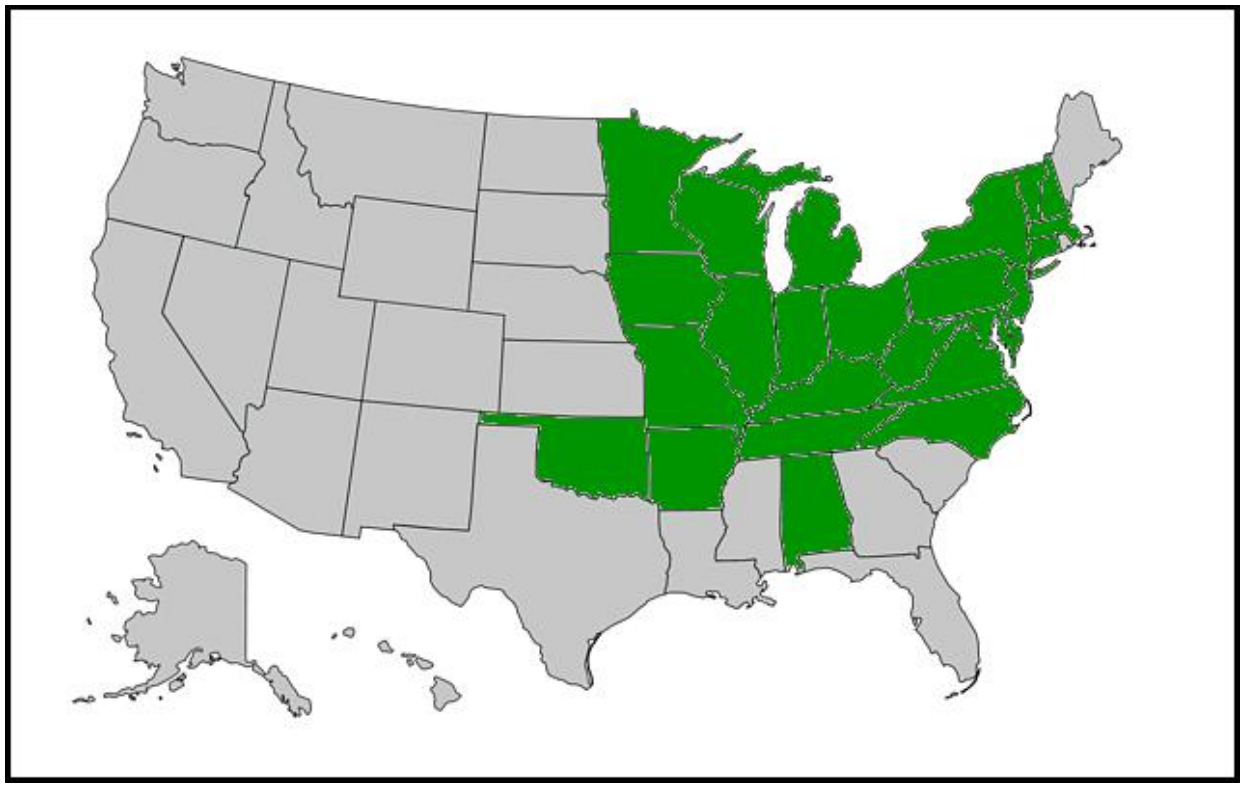

Figure 1. Distribution of C. copulata in the United States (source data from Fernald 1906, Bean et al. 1962, Mid-Atlantic Herbaria 2025, NatureServe 2025, POWO 2025).

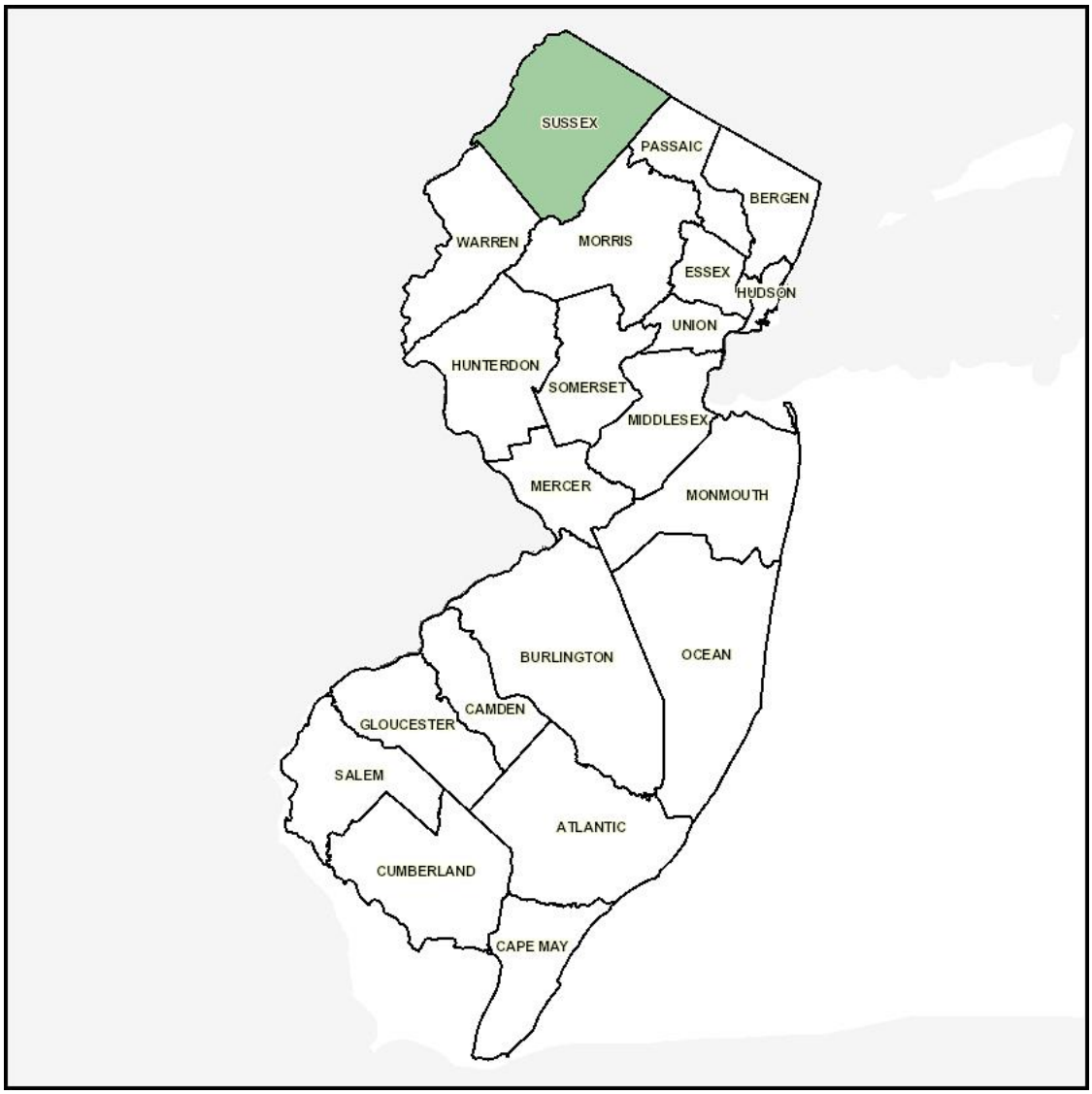

Figure 2. County records of C. copulata in New Jersey (source data from NJNHP 2024).

Conservation Status

Carex copulata is considered globally secure. The G5T5 rank means the sedge 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 2025). The map below (Figure 3) illustrates the conservation status of *C. copulata* throughout its range. Coupled Sedge is imperiled (high risk of extinction) in three states and critically imperiled (very high risk of extinction) in four states. In other places where it occurs the species is apparently secure or unranked.

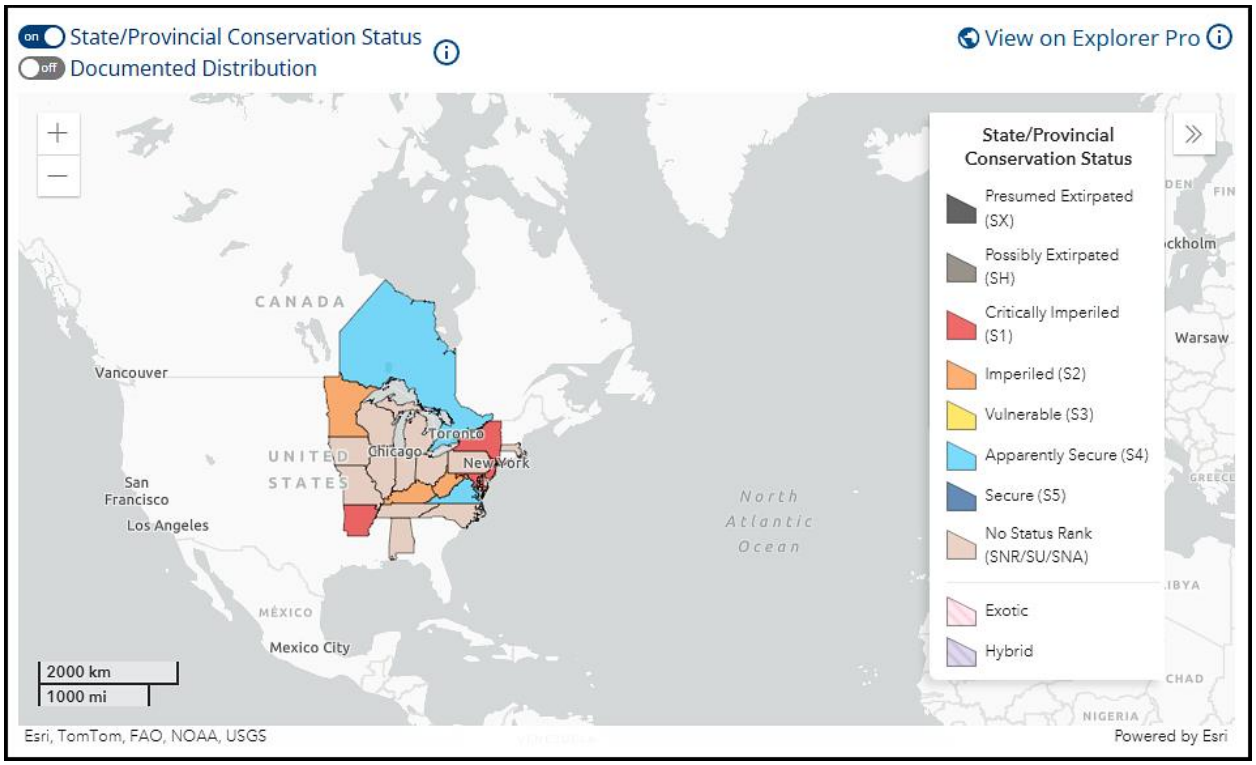

Figure 3. Conservation status of C. copulata in North America (NatureServe 2025).

Carex copulata 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. *C. copulata* 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 *C. copulata* signify that the sedge is eligible for protection under the jurisdictions of the Highlands Preservation Area (HL) and the New Jersey Pinelands (LP) (NJNHP 2010).

Kenneth Mackenzie collected *Carex copulata* in Sussex County, New Jersey during 1917 and included that material in his description of the species (Mackenzie 1917, 1935). Fernald (1942) noted that the sedge had been tentatively identified in other parts of the state (including Camden, Gloucester, and Hunterdon counties) although the records could not be confirmed because the purported specimens lacked fully developed perigynia. Coupled Sedge was initially listed as a historical species but an extant population was discovered by David Snyder in 2005 (NJNHP 2001, 2024).

Threats

Although *Carex copulata* has a fairly large range the sedge tends to be infrequent in the places where it occurs (Naczi et al. 2020). No broad areas of concern have been identified but

individual populations might be threatened by development, logging, right-of-way maintenance, off-road vehicles, or invasive species (Soteropoulos 2024). Herbivore pressure was noted as a possible cause its apparent disappearance from a site along the Potomac River (Landsman et al. 2024), although Pickering et al. (2024) characterized *C. copulata* (along with other sedges, grasses, and ferns) as non-preferred browse material. No particular threats were reported at the site of the New Jersey occurrence (NJNHP 2024). While no information was found regarding the competitive abilities of *C. copulata*, some of the highly invasive plant species that are already widespread in the northern part of the state could certainly become a problem for the New Jersey population in the future.

Climate Change Vulnerability

Information from the references cited in this profile was used to evaluate the vulnerability of New Jersey's *Carex copulata* population 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 *C. copulata* 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, some aspects of the sedge's life history remain poorly understood.

As the climate continues to warm, plant communities in New Jersey are increasingly exposed to higher temperatures while changing precipitation patterns in the region are resulting in more frequent floods and lengthier droughts (Hill et al. 2020). The global distribution of *Carex copulata* suggests that the species is capable of withstanding warmer conditions and a longer growing season. Extended periods of desiccation might be damaging to mature plants or dormant seeds and—although the establishment requirements for seedlings are currently unknown—drought would likely be detrimental during that phase as well. The extant New Jersey occurrence is in a location that has limited exposure to inundation, but changes in flood frequency or intensity could threaten other populations that are situated in bottomland habitats (Landsman et al. 2024). If myrmecochory proves to be important for the dispersal of *C. copulata* seeds the critical ant-plant relationships could be affected by climate change (see Warren et al. 2017), but that remains to be seen.

Management Summary and Recommendations

The inconsistent results derived from myrmecochory studies of *Carex laxiculmis* might reflect local differences in ant or plant community composition, but some work is needed to determine whether the insects play a significant role in the distribution of *Carex copulata* seeds. Other suggested topics for research include the species' germination and establishment requirements and potential utilization of fungal associates.

New Jersey's only known population of *Carex copulata* was last seen in 2008 so a monitoring visit is recommended to assess colony size, habitat condition, and current threats. Nearly a century passed between the first documentation of the species in the state and the discovery of a second population (NJNHP 2024). It is possible that other small occurrences were overlooked during the interim and targeted searches of suitable habitat might turn up some additional colonies.

Synonyms and Taxonomy

The accepted botanical name of the species is *Carex copulata* (L. H. Bailey) Mack. Some orthographic variants, synonyms, and common names are listed below. *Carex copulata* is morphologically similar to *C. digitalis* and *C. laxiculmis*, and over the years it has been described as a variety of each or a hybrid of both (Bailey 1886 & 1889, Fernald 1906 & 1942). Mackenzie (1935) remarked that *C. copulata* was "certainly not a hybrid" and Naczi (1999) subsequently ruled out hybridization as an explanation of its origin based on chromosomal studies. Naczi indicated that the results supported it as a variety of *C. laxiculmis* but did not completely discount the appropriateness of species status. Weakley et al. (2024) accepted the name *Carex copulata* but noted that recognition of the taxon at the species level is controversial. Most of the sources used for this profile identified the sedge as *C. laxiculmis* var. *copulata* (Bryson and Naczi 2020, ITIS 2025, NatureServe 2025, POWO 2025, USDA NRCS 2025). Kartesz (2015) included it in *C. laxiculmis* but did not recognize any varieties.

Botanical Synonyms	**Common Names**
Carex × copulata (L. H. Bailey) Mack.	Coupled Sedge
Carex laxiculmis Schwein. var. *copulata* (L. H. Bailey) Fernald	Spreading Sedge
Carex digitalis var. *copulata* (L. H. Bailey) L. H. Bailey	Green Wood Sedge
Carex retrocurva var. *copulata* L. H. Bailey	

References

Alexeev, Yurii Evgeneevich. 1988. Ontogenesis in *Carex* species. Aquatic Botany 30(1–2): 39–48.

Arsenault Matt, Glen H. Mittelhauser, Don Cameron, Alison C. Dibble, Arthur Haines, Sally C. Rooney, and Jill E. Weber. 2013. Sedges of Maine: A Field Guide to Cyperaceae. University of Maine Press, Orono, ME. 712 pp.

Bailey, L. H. Jr. 1886. Biodiversity occurrence data published by Harvard University Herbaria. Accessed through the Mid-Atlantic Herbarium Consortium On June 29, 2025 at https://midatlanticherbaria.org/portal/index.php

Bailey, L. H. Jr. 1889. Studies of the types of various species of the genus *Carex*. Notes on *Carex* - XI. Memoirs of the Torrey Botanical Club 1(1): 1–86.

Bean, Ralph C., A. F. Hill, and Richard J. Eaton. 1962. Fifteenth report of the Committee on Plant Distribution. Rhodora 64(758): 168–179.

Beattie, Andrew J. and David C. Culver. 1981. The guild of myrmecochores in the herbaceous flora of West Virginia forests. Ecology 62(1): 107–115.

Bernard, John M. 1990. Life history and vegetative reproduction in *Carex*. Canadian Journal of Botany 68(7): 1441–1448.

Bertin, Robert I. 2007. Sex allocation in *Carex* (Cyperaceae): Effects of light, water, and nutrients. Canadian Journal of Botany 85(4): 377–384.

Bond, Alison. 1999. Germination ecology of *Carex* (Cyperaceae): Effects of light, stratification, and soil moisture. Master's Thesis, McGill University, Montreal, Canada. 95 pp.

Bryson, Charles T. and Robert F. C. Naczi. Page updated November 5, 2020. *Carex laxiculmis* var. *copulata* (L. H. Bailey) Fernald. In: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico [Online]. 22+ vols. New York and Oxford. Accessed June 28, 2025 at https://floranorthamerica.org/Carex_laxiculmis_var._copulata

Clausen, Robert T. and Herbert A. Wahl. 1939. Plants of central Pennsylvania. Rhodora 41(481): 28–34.

Cratty, R. I. 1898. The Iowa Sedges. Bulletin from the Laboratories of Natural History of the State University of Iowa 4: 313–375.

Faber-Langendoen, D. 2018. Northeast Regional Floristic Quality Assessment Tools for Wetland Assessments. NatureServe, Arlington, VA. 52 pp.

Fassett, Norman C. 1957. A Manual of Aquatic Plants. Second Edition. University of Wisconsin Press, Madison, WI. 405 pp.

Fernald, M. L. 1906. Some new or little known Cyperaceae of eastern North America. Rhodora 8: 181–184.

Fernald, M. L. 1942. The seventh century of additions to the flora of Virginia. Contributions from the Gray Herbarium of Harvard University 145: 341–405, 416–452, and 457–484.

Fessler, Grant. 2025. Woodland Sedges of the Quad Cities Region. 18 pp. Accessed June 28, 2025 at https://qcflora.org/wp-content/uploads/2025/06/woodland-sedges-of-the-qc-region-species-profiles.pdf

Friedman, Jannice and Spencer C. H. Barrett. 2009. The consequences of monoecy and protogyny for mating in wind-pollinated *Carex*. New Phytologist 181: 489–497.

Gaddy, L. L. 1986. Twelve new ant-dispersed species from the southern Appalachians. Bulletin of the Torrey Botanical Club 113(3): 247–251.

Goetghebeur, P. 1998. Cyperaceae. In Klaus Kubitzki and T. Stuzel (eds). The Families and Genera of Vascular Plants, Volume 4: Flowering Plants, Monocotyledons: Alismatanae and Commelinanae (Except Gramineae). Springer-Verlag, Berlin.

Handel, Steven N. 1978a. Self-compatibility in *Carex plantaginea* and *C. platyphylla* (Cyperaceae). Bulletin of the Torrey Botanical Club 105(3): 233–234.

Handel, Steven N. 1978b. The competitive relationship of three woodland sedges and its bearing on the evolution of ant-dispersal of *Carex pedunculata*. Evolution 32(1): 151–153.

Heithaus, E. Raymond. 1981. Seed predation by rodents on three ant-dispersed plants. Ecology 62: 136–145.

Hermann, Frederick J. 1941. The genus *Carex* in Michigan. The American Midland Naturalist 25(1): 1–72.

Hill, Rebecca, Megan M. Rutkowski, Lori A. Lester, Heather Genievich, and Nicholas A. Procopio (eds.). 2020. New Jersey Scientific Report on Climate Change, Version 1.0. New Jersey Department of Environmental Protection, Trenton, NJ. 184 pp.

Holm, Theo. 1896. Studies upon the Cyperaceae: On the monopodial ramification in certain North-American species of *Carex*. American Journal of Science 1(5): 348–350.

Hyatt, Philip E. 1998a. Arkansas *Carex* (Cyperaceae): A briefly annotated list. SIDA, Contributions to Botany 18(2): 535–554.

Hyatt, Philip E. 1998b. *Carex* (Cyperaceae) sedges of the Buffalo National River (Arkansas): A preliminary list. Castanea 63(2): 174–179.

ITIS (Integrated Taxonomic Information System). Accessed January 31, 2025 at http://www.itis.gov

Kartesz, J. T. 2015. The Biota of North America Program (BONAP). Taxonomic Data Center. (http://www.bonap.net/tdc). Chapel Hill, NC.

Knowlton, C. H., J. A. Cushman, and Walter Deane. 1912. Reports on the flora of the Boston district—XIV. Cyperaceae. *Carex*, L. to N. Rhodora 14(160): 76–78.

Ladd, Douglas and Justin R. Thomas. 2015. Ecological checklist of the Missouri flora for Floristic Quality Assessment. Phytoneuron 12: 1–274.

Landsman, Andrew P., Layne Strickler, Clara R. Thiel, Rachael Renzi, Vida J. Svahnström, Stephanie Siemek, Kristen Shelton, and Chris Frye. 2024. Importance of a small, urban–

suburban national park to the conservation of rare, threatened, and endangered plant species. Northeastern Naturalist 31(1): 120–145.

Lea, Christopher and Christopher T. Frye. 2002. *Carex* (Cyperaceae) in the Potomac River Gorge of Maryland, Virginia, and the District of Columbia. Bartonia 61: 93–116.

Leck, Mary Allessio and Charles F. Leck. 2005. Vascular plants of a Delaware River tidal freshwater wetland and adjacent terrestrial areas: Seed bank and vegetation comparisons of reference and constructed marshes and annotated species list. Journal of the Torrey Botanical Society 132(2): 323–354.

Leck, Mary Allessio and Wolfgang Schütz. 2005. Regeneration of Cyperaceae, with particular reference to seed ecology and seed banks. Perspectives in Plant Ecology, Evolution and Systematics 7: 95–133.

Mackenzie, Kenneth K. 1917. Biodiversity occurrence data published by New York Botanical Garden Steere Herbarium. Accessed through Mid-Atlantic Herbarium Consortium at https://midatlanticherbaria.org/portal/index.php on June 29, 2025.

Mackenzie, Kenneth Kent. 1935. Cariceae. North American Flora 18(5): 241–312.

McFadden, Thomas Steele. 2018. The Vascular Flora of the Red River Gorge in Powell, Menifee, and Wolfe Counties Kentucky. Master's Thesis, Eastern Kentucky University, Richmond, KY. 178 pp.

Mid-Atlantic Herbaria. 2025. Accessed at https://midatlanticherbaria.org/portal/index.php on June 29, 2025.

Miller, Brian. 2023. Two photos of *Carex laxiculmis* var. *copulata* from Ontario. Shared via iNaturalist at https://www.inaturalist.org/observations/194197957, licensed by https://creativecommons.org/licenses/by-nc/4.0/

Myers, Jonathan A., Mark Velland, Sana Gardescu, and P. L. Marks. 2004. Seed dispersal by White-tailed Deer: Implications for long-distance dispersal, invasion, and migration of plants in eastern North America. Oecologia 139: 35–44.

Naczi, R.F.C. 1999. Chromosome numbers of some eastern North American species of *Carex* and *Eleocharis* (Cyperaceae). Contributions from the University of Michigan Herbarium 22: 105–119.

Naczi, Robert F. C., Robert Kral, and Charles T. Bryson. 2001. *Carex cumberlandensis*, a new species of section Careyanae (Cyperaceae) from the eastern United States of America. SIDA, Contributions to Botany 19(4): 993–1014.

Naczi, Robert F. C., T. Wayne Barger, Daniel D. Spaulding, Matthew R. Naczi, Jenna E. Dorey, and Jimmy K. Triplett. 2020. Revealing a significant center of sedge diversity: *Carex*

(Cyperaceae) of Jackson County, Alabama, U.S.A. The American Midland Naturalist 184(1): 17–47.

NatureServe. 2025. NatureServe Explorer [web application]. NatureServe, Arlington, VA. Accessed June 29, 2025 at https://explorer.natureserve.org/

NJNHP (New Jersey Natural Heritage Program). 2001. List of Endangered Plant Species and Plant Species of Concern, September 2001. Biotics Database. NatureServe, Arlington, Virginia.

NJNHP (New Jersey Natural Heritage Program). 2010. Explanation of Codes Used in Natural Heritage Reports. Updated March 2010. Available at https://nj.gov/dep/parksandforests/natural/docs/nhpcodes_2010.pdf

NJNHP (New Jersey Natural Heritage Program). 2024. Biotics 5 Database. NatureServe, Arlington, VA. Accessed March 15, 2024.

Oldham, Michael J. 1987. Image of *Carex laxiculmis* var. *copulata* specimen from Ontario. Shared via iNaturalist at https://www.inaturalist.org/observations/103206322, licensed by https://creativecommons.org/licenses/by-nc/4.0/

Pickering, Joshua K., Michael S. W. Bradstreet, and D. Ryan Norris. 2024. Less is more: Vegetation changes coincide with White-tailed Deer suppression over thirty years. Wildlife Monographs 214(1): e1081.

Poindexter, Derick Bret. 2006. Vascular Flora of Mount Jefferson State Natural Area and Environs, Ashe County, North Carolina. Master's Thesis, Appalachian State University, Boone, NC. 371 pp.

Poindexter, Derick B. 2013. Vascular flora and plant communities of Allegheny County, North Carolina. Journal of the Botanical Research Institute of Texas 7(1): 529–574.

POWO. 2025. Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Accessed June 29, 2025 at http://www.plantsoftheworldonline.org/

Reznicek, A. A. and P. M. Catling. 1986. Vegetative shoots in the taxonomy of sedges (*Carex*, Cyperaceae). Taxon 35(3): 495–501.

Rhoads, Ann Fowler and Timothy A. Block. 2007. The Plants of Pennsylvania. University of Pennsylvania Press, Philadelphia, PA. 1042 pp.

Ring, Richard M., Elizabeth A. Spencer, and Kathleen Strakosch Walz. 2013. Vulnerability of 70 Plant Species of Greatest Conservation Need to Climate Change in New Jersey. New York Natural Heritage Program, Albany, NY and New Jersey Natural Heritage Program, Department of Environmental Protection, Office of Natural Lands Management, Trenton, NJ, for NatureServe #DDCF-0F-001a, Arlington, VA. 38 pp.

Slaughter, Bradford S. 2020. Vascular flora of Pierce Cedar Creek Institute, Barry County, Michigan. The Great Lakes Botanist 59: 99–158.

Slaughter, Bradford S. and Amanda K. Klain. 2019. Additions to the vascular flora, and notes on the phytogeography, of Lake County, Michigan. The Great Lakes Botanist 58: 144–182.

Soteropoulos, D. 2024. *Carex laxiculmis var. copulata* conservation status factors. NatureServe, Arlington, VA. Accessed June 29, 2025 at https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.139816/Carex_laxiculmis_var_copulata

Stimmel, Hattie J. 1898. Illustration from The Iowa Sedges (see Cratty 1898). Public domain image, courtesy of Biodiversity Heritage Library.

Swearingen, Jil. 2021. Myrme-who? Elaio-what? Spring ephemerals enlist ants to spread their seeds. Marilandica 12(1): 7–11.

Terrell, Edward E. 1955. The vascular flora of Clinton County, Ohio. The Ohio Journal of Science 55(4): 215–240.

Tucker, Gordon C. 1987. The genera of Cyperaceae in the southeastern United States. Journal of the Arnold Arboretum 68(4): 361–445.

U. S. Army Corps of Engineers. 2022. National Wetland Plant List, version 3.6. https://nwpl.sec.usace.army.mil/ U. S. Army Corps of Engineers Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH.

USDA, NRCS (U. S. Dept. of Agriculture, Natural Resources Conservation Service). 2025. PLANTS profile for *Carex laxiculmis* var. *copulata* (Spreading Sedge). The PLANTS Database, National Plant Data Team, Greensboro, NC. Accessed February 6, 2025 at http://plants.usda.gov

Walz, Kathleen S., Jason L. Hafstad, Linda Kelly, and Karl Anderson. 2020. Floristic Quality Assessment Index for Vascular Plants of New Jersey: Coefficient of Conservancy (CoC) Values for Species and Genera (update to 2017 list). New Jersey Department of Environmental Protection, New Jersey Forest Service, Office of Natural Lands Management, Trenton, NJ.

Warren, Robert J. II, Joshua R. King, Lacy D. Chick, and Mark A. Bradford. 2017. Global change impacts on ant-mediated seed dispersal in eastern North American forests. In Paulo S. Oliveira and Suzanne Koptur (eds.), Ant-Plant Interactions: Impacts of Humans on Terrestrial Ecosystems. Cambridge University Press, United Kingdom.

Warren, Robert J. II, Mike Olejniczak, Adam Labatore, and Matt Candeias. 2021. How common and dispersal limited are ant-dispersed plants in eastern deciduous forests? Plant Ecology 222: 361-373.

Weakley, A. S. and Southeastern Flora Team. 2024. Flora of the Southeastern United States. Edition of March 4, 2024. University of North Carolina Herbarium, North Carolina Botanical Garden, Chapel Hill, NC. 2203 pp.

Wheeler, Gerald A. and Gerald B. Ownbey. 1984. Annotated list of Minnesota Carices, with phytogeographical and ecological notes. Rhodora 86(846): 151–231.

Young, Bruce E., Elizabeth Byers, Geoff Hammerson, Anne Frances, Leah Oliver, and Amanda Treher. 2016. Guidelines for Using the NatureServe Climate Change Vulnerability Index, Release 3.02, 1 June 2016. NatureServe, Arlington, VA. 65 pp.

Zomlefer, Wendy B. 1994. Guide to Flowering Plant Families. University of North Carolina Press, Chapel Hill, North Carolina. 430 pp.

Żukowski, Waldemar, Agnieszka M. Bogdanowicz, and Marlena Lembicz. 2010. Seed germination in sedges: A short review. Biodiversity Research and Conservation 19: 15–22.