Carex woodii

Wood's Sedge

Cyperaceae

Carex woodii by Nate Martineau, 2020

***Carex woodii* 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

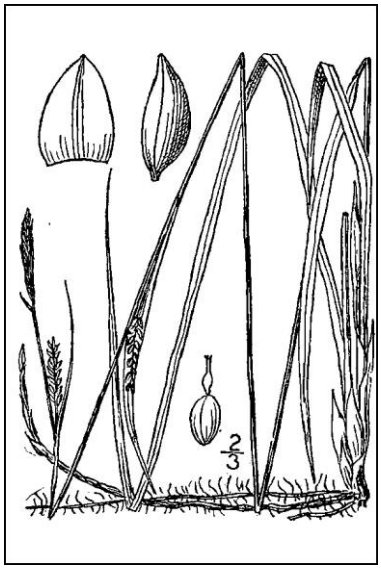
August, 2024

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. 2024. *Carex woodii* 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 woodii (Wood's Sedge) is a rhizomatous perennial sedge in *Carex* section *Paniceae*. The species can spread vegetatively and often forms extensive clonal patches (Hermann 1941, Rothrock 1997, Poindexter 2006, Rhoads and Block 2007). The scaly, purplish rhizomes remain at or near the surface and ramets may be separated by distances of 2.5–18 cm. The basal leaf sheaths are red-purple and the lowest leaves are scale-like. The upper leaves are 5–25 cm long and usually 1.8–3 wide although some may be slightly wider. Many of the plants in a typical clump are sterile but those that flower produce slender, upright culms that are 3–7 dm tall, sharply three-sided, and rough near the top. The terminal spike of *C. woodii* is staminate and the 2–3 lateral spikes are pistillate. Arrangement of the perigynia is more or less loose and alternate, resulting in pistillate spikes that are 1–3.5 cm long and 3–5 mm wide. The pistillate scales can vary in color or shape, and awns may be present or absent. The perigynia are green to brown and lightly nerved, ending in short, bent beaks. The achenes—which generally fill the perigynia—are yellowish brown and triangular with concave sides. (See Britton and Brown 1913, Mackenzie 1935, Fernald 1950, Gleason and Cronquist 1991, Rothrock and Reznicek 2020).



Left: Britton and Brown 1913, courtesy USDA NRCS 2024a. Center and Right: Katy Chayka, 2016 and 2018.

Carex woodii flowers from late April through mid-May and the achenes develop by early summer (Lea and Frye 2002, Rothrock and Reznicek 2020, Weakley et al. 2024). In New Jersey, fruiting plants have been found during late May or early June (NJNHP 2024). Once *C. woodii* fruits have matured the perigynia fall off quickly (Cusick 1989).

In New Jersey, *Carex woodii* is most likely to be confused with *C. tetanica* or *C. meadii*; in fact, it has sometimes been viewed as a subspecies of *C. tetanica* (see Synonyms section). However, even in a vegetative state *C. woodii* can be distinguished from those species by its clonal habit, superficial rhizomes, scale-like basal leaves, and red-purple leaf sheaths (Hermann 1938, Rothrock and Reznicek 2020). Without careful examination *Carex woodii* could also be mistaken for *C. pensylvanica* and the two sedges sometimes co-occur. *C. pensylvanica* forms

tighter clumps and has shorter, darker leaves and in fruit its achenes do not fill the perigynia (Rothrock 1997, Lea and Frye 2002, Poindexter 2006, Weakley et al. 2024).

Some differing chromosome counts (22 and 26) were reported for *C. woodii* by Wahl (1940). Naczi (1999) obtained a count of 22 for the sedge but noted that it is not unusual for chromosome numbers to vary in *Carex* species.

Pollinator Dynamics

The majority of species in the sedge family are pollinated by wind, although there are a few notable exceptions in scattered genera including *Carex* (Goetghebeur 1998). Adaptations to wind pollination in the family include large anthers, long filaments, and prominent stigmas (Zomlefer 1994).

In nearly all sedges, the female flowers develop before the male flowers (protogyny) and the lowest flowers on a spikelet are the first to mature (Goetghebeur 1998). Both strategies have generally been interpreted as means of reducing the opportunities for self-pollination. Nevertheless, self-compatibility is common in *Carex* (East 1940, Bertin 2007, Friedman and Barrett 2009). Study of another species in section *Paniceae* (*C. polymorpha*) supported the premise of self-compatibility (Standley and Dudley 1991). Friedman and Barrett (2009) suggested 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 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 *Carex*, some of which were inferred from morphology (Leck and Schütz 2005, Newhouse et al. 1995). The fruits of Wood's Sedge have no evident structures to facilitate dispersal. Cusick's (1989) observation that the perigynia of *C. woodii* were "quickly deciduous" is consistent with the opinion of Żukowski et al. (2010) that gravity is the primary dispersal strategy for sedges. Some 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 seed viability has been documented in a number of sedges dispersed by birds or hoofed mammals (Leck and Schütz 2005).

No specific information was found regarding seed longevity or the germination requirements of *Carex woodii*. The majority of sedges are persistent in the seed bank, including the related *C. panicea* (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* seeds typically sprout underground, producing their first leaf 4–5 days after germination (Alexeev 1988). It is not clear whether *C. woodii* forms any fungal associations. Mycorrhizae were found in another member of section *Paniceae*, *C. tetanica*, but only in one of two plants that were examined (Miller et al. (1999).

Established populations of *Carex woodii* appear to be maintained largely by clonal reproduction. Rothrock (1997) remarked that flowering and fruiting was sparse in the species, and Hermann (1941) had previously observed that some colonies of *C. woodii* fruited abundantly from time to time but went for years without flowering in between. The related *C. polymorpha* is reportedly difficult to grow from seed (Everett 2000).

Habitat

Carex woodii is equally at home in open or shaded habitats (Szakacs et al. 2022, Weakley et al. 2024). It has been found at elevations ranging from 50–1600 meters above sea level (Rothrock and Reznicek 2020). *C. woodii* has been reported in numerous woodland habitats over a variety of substrates (Mackenzie 1935, Clausen and Wahl 1939, Hermann 1941, Hartley 1960, Tucker 1972, Pusateri et al. 1993, Rothrock 1997, Kaufmann et al. 2004, Rhoads and Block 2007, White 2010). The forest canopies are usually dominated by deciduous trees such as *Acer*, *Fagus*, *Quercus*, and *Tilia* species (Hermann 1938, Thorne 1956, Aldrich et al. 1986, Naczi and Thieret 2000, Poindexter 2006, Corio et al. 2009, Lynch et al. 2020) but the sedge can also be found in sites where evergreen species such as *Pinus* or *Tsuga* are prevalent (Cusick 1996, Breden et al. 2001).

One of New Jersey's extant populations of *Carex woodii* is situated in typical upland forest habitat but the other is growing on hummocks in a mucky, brushy, calcareous fen (NJNHP 2024). Bissell (1903) reported the species in comparable habitat in Connecticut, although no substantiating specimens of *C. woodii* have been found for any New England states (Angelo and Boufford 2007). There have also been some recent observations of Wood's Sedge in seepage wetland communities in Missouri and Tennessee (Thomas 2017, Floden and Schilling 2018), while other occurrences in Maryland, Michigan, and West Virginia have been documented in locations that are occasionally subject to flooding (Cusick 1996, Lea and Frye 2002, Bassett 2011).

Wetland Indicator Status

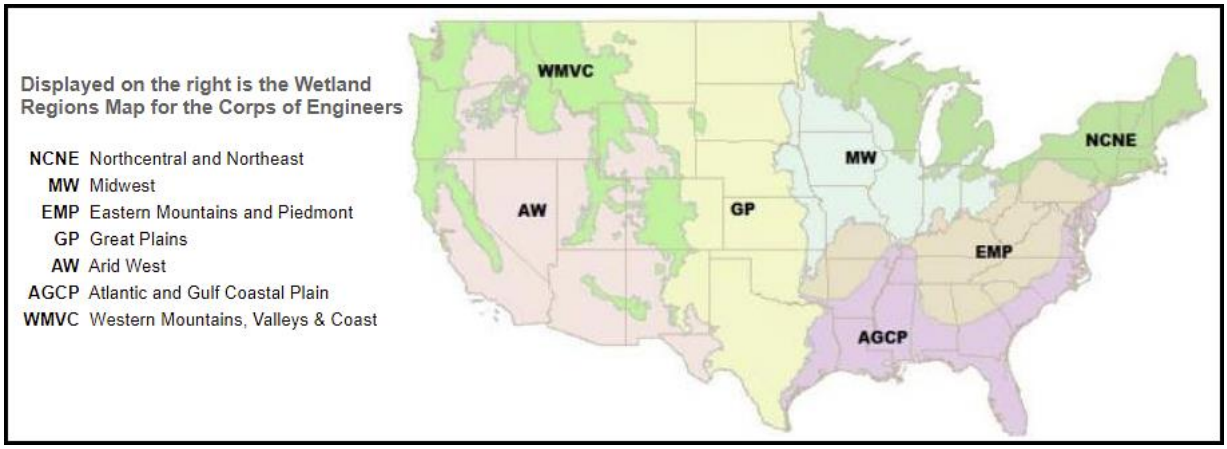


Figure 1. Mainland U. S. wetland regions, adapted from U. S. Army Corps of Engineers (2020).

The U. S. Army Corps of Engineers divided the country into a number of regions for use with the National Wetlands Plant List and portions of New Jersey fall into three different regions (Figure 1 above). *Carex woodii* has more than one wetland indicator status in the state. In the Northcentral and Northeast region, Wood's Sedge is a facultative upland species, meaning that it usually occurs in nonwetlands but may occur in wetlands. In the rest of the state it is an upland species, meaning that it almost never occurs in wetlands (U. S. Army Corps of Engineers 2020).

USDA Plants Code (USDA, NRCS 2024b)

CAWO2

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

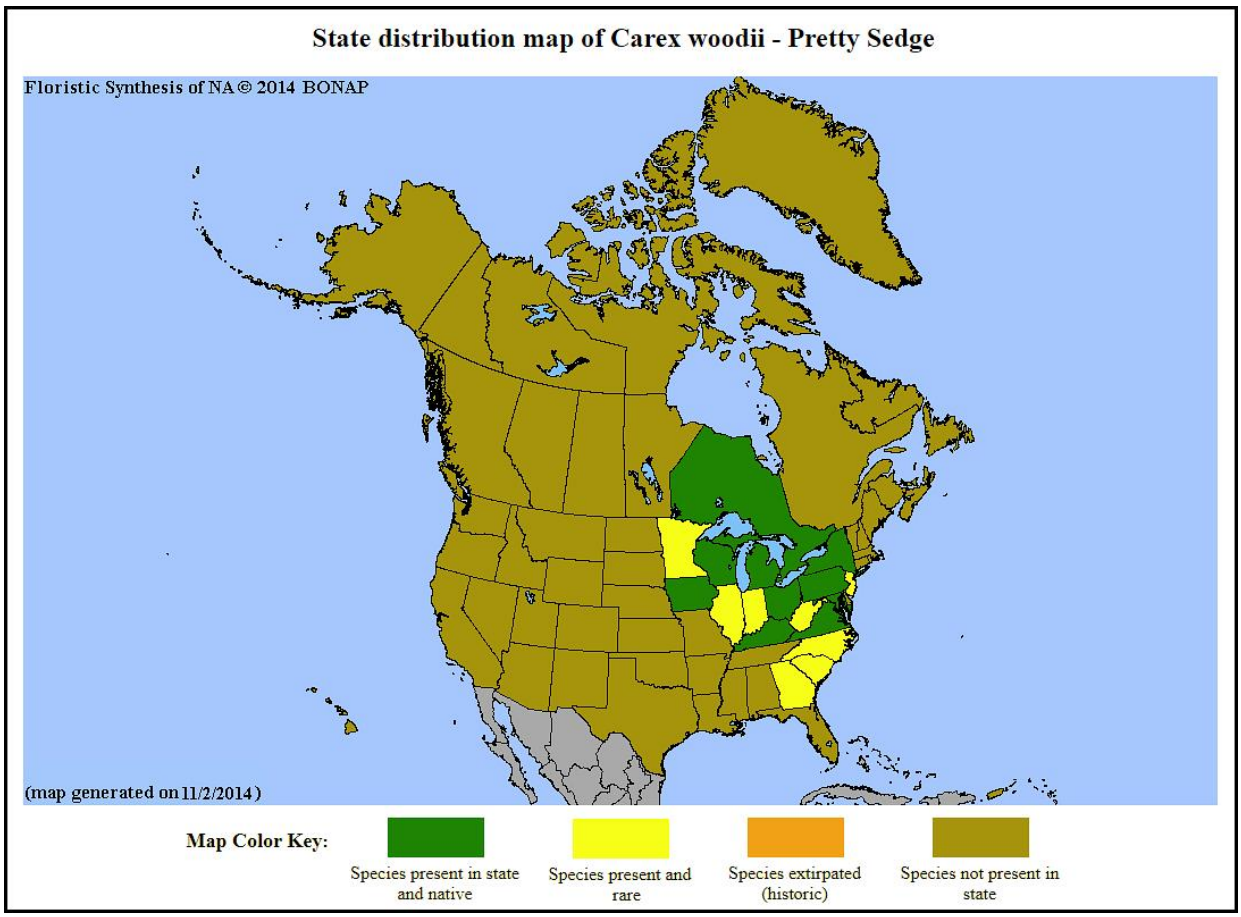


Figure 2. Distribution of C. woodii in North America, adapted from BONAP (Kartesz 2015).

The global range of *Carex woodii* is restricted to North America (POWO 2024). The map in Figure 2 (above) depicts the extent of the species in the United States and Canada.

The USDA PLANTS Database (2024b) shows records of *Carex woodii* for one New Jersey county: Sussex County (Figure 3 below). The map accurately reflects the known distribution of Wood's Sedge in the state.

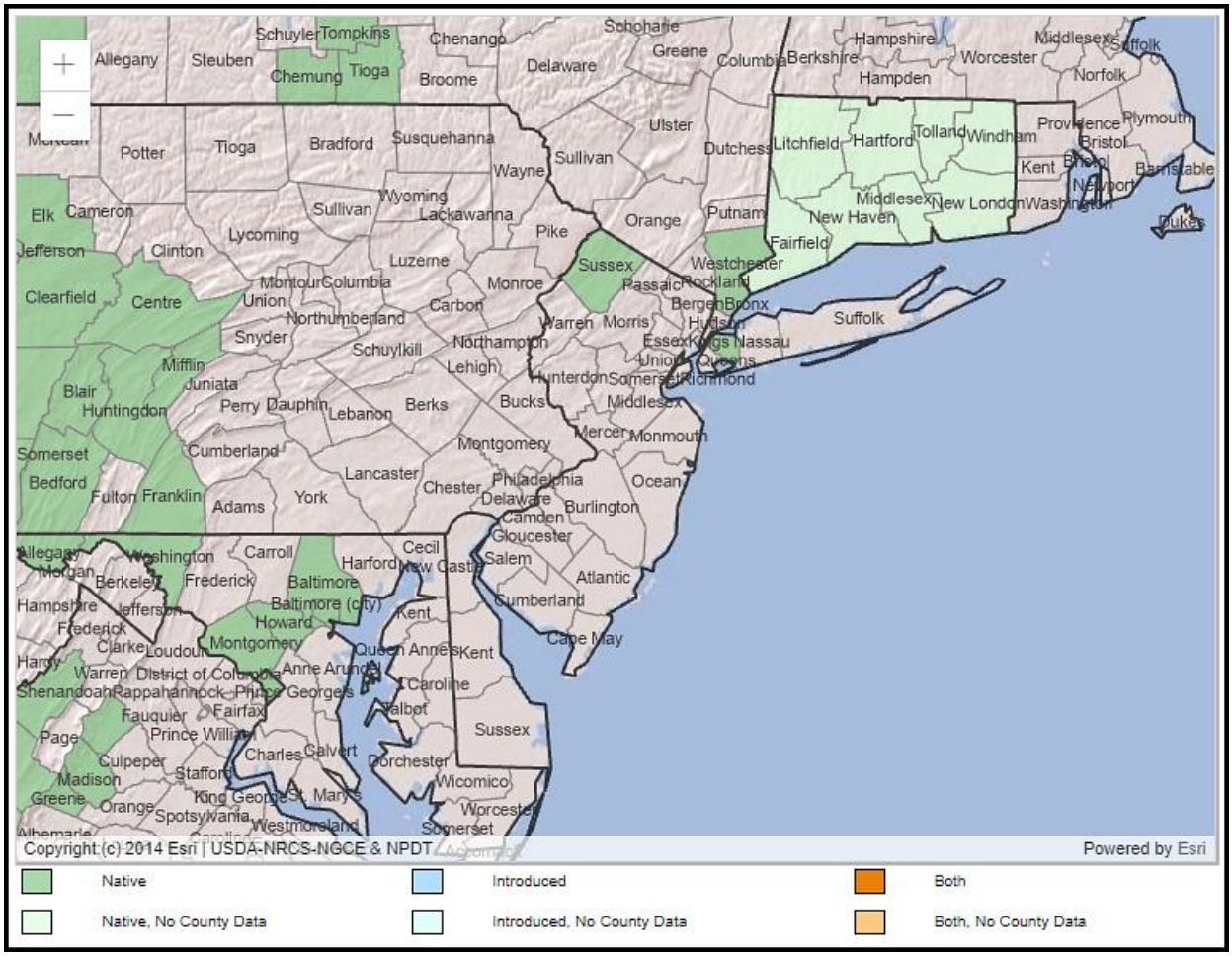


Figure 3. County records of C. woodii in New Jersey and vicinity (USDA NRCS 2024b).

Conservation Status

Carex woodii is apparently secure at a global scale. The G4 rank means the species is at 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 recent local declines, threats, or other factors (NatureServe 2024). The map below (Figure 4) illustrates the conservation status of *C. woodii* throughout its range. The sedge is vulnerable (moderate risk of extinction) in five states, critically imperiled (very high risk of extinction) in six states, and likely extirpated in the District of Columbia and New Hampshire.

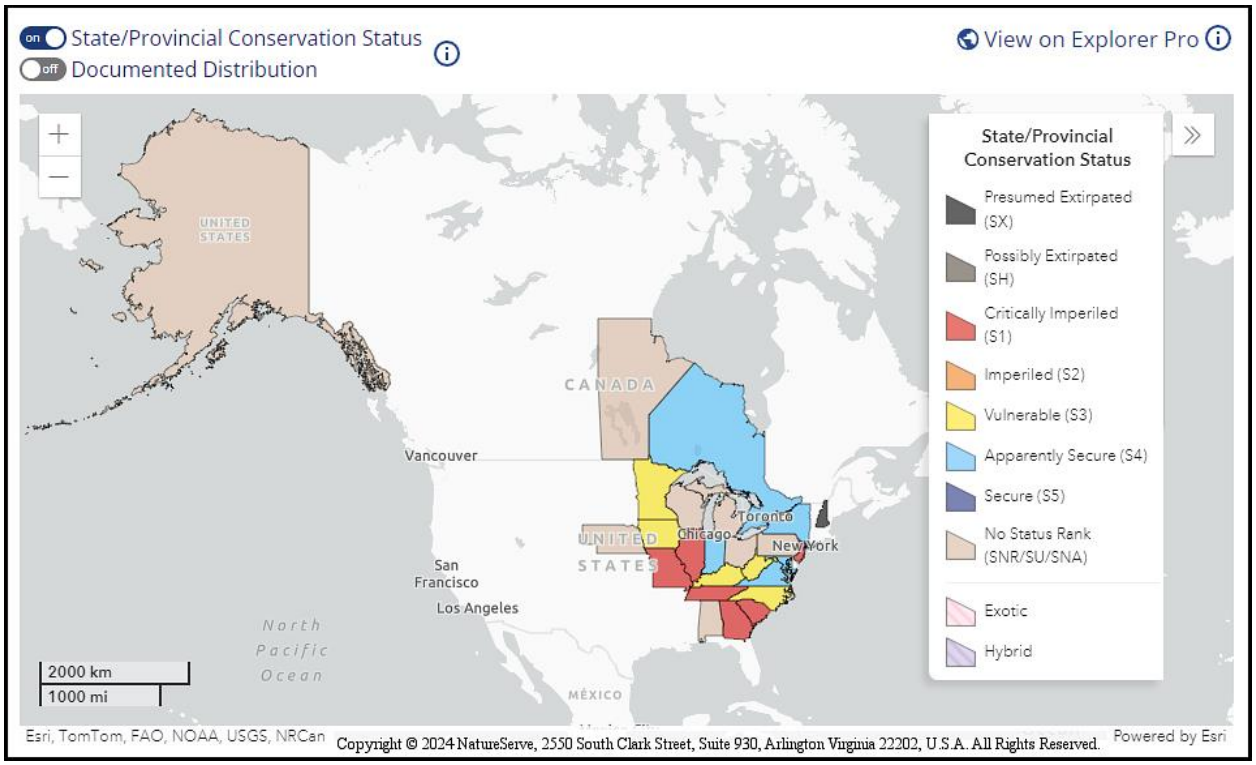


Figure 4. Conservation status of C. woodii in North America (NatureServe 2024).

New Jersey is one of the states where *Carex woodii* is critically imperiled (NJNHP 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. woodii* 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 sedge signify that it is eligible for protection under the jurisdictions of the Highlands Preservation Area (HL) and the New Jersey Pinelands (LP) (NJNHP 2010).

Carex woodii was initially listed as a historical species in New Jersey based on an old record from the early 1900s but it was reclassified as an S1.1 (critically imperiled with only one documented occurrence) after David Snyder discovered a population in 2001. The status was revised to S1 following the recent discovery of a second population (NJONLM 1992, NJNHP 2019 & 2024).

Threats

Carex woodii is generally rare in the southern United States (Figure 4) and populations in the northern part of its range are scattered (Naczi and Thieret 2000). However, the species can be locally abundant in the places where it occurs. Since Wood's Sedge is able to thrive in a variety

of community types, habitat requirements do not appear to restrict its distribution. Low rates of sexual reproduction and poor long-distance dispersal seem more likely to be limiting factors.

No imminent threats to the New Jersey occurrences of *Carex woodii* have been identified. Although some concerns—including successional changes and the presence of invasive plant species—were observed at one site they did not appear to be having any notable impact on the sedge population (NJNHP 2024).

General threats reported for the species as a whole include forest management practices or loss of habitat to development and similar activities (NatureServe 2024). Wolf et al. (2008) studied the impacts of forest management practices on understory plants in Wisconsin, evaluating the consequences of summer vs. winter harvesting as well as the proximity of logging roads. However, such low numbers of *C. woodii* plants were found in all plot types that any potential effects were probably masked by its overall scarcity. Since the typical life strategy of the sedge is to form large clonal populations in a relatively small number of places, the loss of any site where the species is already established can take on greater significance.

Carex woodii is probably susceptible to one or more kinds of smut fungi. Several species of *Anthracoidea*, including *A. caricis-meadii*, *A. laxa*, and *A. paniceae*, have been documented on other sedges in section *Paniceae* (Saychenko et al. 2013), and individual types of *Anthracoidea* generally infect multiple *Carex* species in the same section. The fungi target pistillate flowers or spikes and their spores develop in place of the sedges' seeds (Fisher 1953, Denchev et al. 2021). The fungal spores can then be transmitted to nearby plants by wind or by insects (Ericson et al. 1993).

Climate Change Vulnerability

An assessment of the potential effects of climate change on selected plants determined that *Carex woodii* was moderately vulnerable in New Jersey, signifying that the species is likely to show some decrease in its range or extent in the state by 2050 (Ring et al. 2013). A similar conclusion was reached when the sedge was evaluated in Illinois (Molano-Flores et al. 2019).

In New Jersey, the impacts of climate change include both elevated temperatures and an increase in extreme conditions such as droughts and floods (Hill et al. 2020). The likelihood of drought sensitivity was one of the biggest factors contributing to the vulnerability of *Carex woodii* in New Jersey (Ring et al. 2013). Additional ways that climate could affect the species have been suggested but they are presently only speculative. For example, Hermann (1941) indicated that the irregular fruiting he had observed in the species might be driven by variations in annual rainfall amounts. Research is needed to determine what triggers flowering in *C. woodii* and whether the climate plays a role in stimulating or deferring sexual reproduction.

Management Summary and Recommendations

In addition to the effects of various climactic factors on the life cycle of *Carex woodii* there are other areas where critical information is lacking about the species. Studies of seed longevity, germination requirements, and establishment are needed. It would also be useful to understand the relative importance of sexual vs. clonal reproduction in populations of the sedge.

There is growing evidence that *Carex woodii* is more abundant than it was previously thought to be, at least in some parts of its range. The sedge has often been overlooked (Weakley et al. 2024), and characteristics that may have contributed to that include infrequent flowering, a short period of fruit retention, and its vegetative similarity to more common species that share its habitat (Cusick 1989, Rothrock 1997, Lea and Frye 2002). Focused searches have turned up numerous populations in Indiana, where it was once viewed as rare (Homoya et al. 1995), and resulted in its delisting as a special concern species in Minnesota (MNDNR 2024). Targeted quests for *C. woodii* might turn up additional populations in New Jersey, although searching for it could prove to be a daunting task because the sedge can utilize an assortment of habitats.

Synonyms

The accepted botanical name of the species is *Carex woodii* Dewey. Orthographic variants, synonyms, and common names are listed below (ITIS 2024, POWO 2024, USDA NRCS 2024b). Although Dewey (1846) thought that *C. woodii* was very distinct in appearance, Mackenzie (1910) examined some of the specimens used for the original description and concluded that they may have represented a slender form of *C. tetanica*. However, he viewed other specimens that Bailey (1889) had identified as *C. tetanica* var. *woodii* as distinctive enough to warrant species status and published it as *Carex colorata*, subsequently subsuming that name under *C. woodii* (Mackenzie 1935). Despite Mackenzie's efforts to provide clarification, Bailey's name remained in use for decades in some circles and eventually Wood's Sedge was cited as an example of a problematic taxon due to its simultaneous recognition as both *C. tetanica* var. *woodii* and *C. woodii* in different places or publications (Reznicek 1989, Standley 1992). The issue now appears to be resolved, as *Carex woodii* is utilized by most current sources.

Botanical Synonyms	**Common Names**
Carex colorata Mack.	Wood's Sedge
Carex tetanica var. *woodii* (Dewey) Alph. Wood	Pretty Sedge
	Wood's Stiff Sedge

References

Aldrich, James R., Lee A. Casebere, and Michael A. Homoya. 1986. The discovery of native rare vascular plants in northern Indiana. Proceedings of the Indiana Academy of Science 95: 421–428.

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

Angelo, Ray and David E. Boufford. 2007. Atlas of the flora of New England: Cyperaceae. Rhodora 109(939): 237–360.

Bailey, L. H. 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.

Bassett, Tyler. 2011. Annotated checklist of the flora of the Kalamazoo Nature Center with natural community descriptions. The Michigan Botanist 50: 41–104.

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

Bissell, C. H. 1903. A botanical trip to Salisbury, Connecticut. Rhodora 5(49): 32–35.

Breden, Thomas F., Yvette R. Alger, Kathleen Strakosch Walz, and Andrew G. Windisch. 2001. Classification of Vegetation Communities of New Jersey: Second iteration. Association for Biodiversity Information and New Jersey Natural Heritage Program, Office of Natural Lands Management, Division of Parks and Forestry, NJ Department of Environmental Protection, Trenton, NJ. 230 pp.

Britton, N. L. and A. Brown. 1913. An Illustrated Flora of the Northern United States and Canada in three volumes: Volume I (Ferns to Buckwheat). Second Edition. Reissued (unabridged and unaltered) in 1970 by Dover Publications, New York, NY. 680 pp.

Chayka, Katy. 2016, 2018. Two photos of *Carex woodii*. Images courtesy of Minnesota Wildflowers, https://www.minnesotawildflowers.info/grass-sedge-rush/pretty-sedge licensed by https://creativecommons.org/licenses/by-nc-nd/3.0/.

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

Corio, Kathryn, Amy Wolf, Michael Draney, and Gary Fewless. 2009. Exotic earthworms of great lakes forests: A search for indicator plant species in maple forests. Forest Ecology and Management 258: 1059–1066.

Cusick, Allison W. 1989. Seven indigenous taxa new to the vascular flora of Kentucky. Castanea 54(4): 268–270.

Cusick, Allison W. 1996. Notes on the genus *Carex* (Cyperaceae) in West Virginia. Castanea 61(2): 161–167.

Denchev, Teodor T., Cvetomir M. Denchev, Jacob Koopman, Dominik Begerow, and Martin Kemler. 2021. Host specialization and molecular evidence support a distinct species of smut

fungus, *Anthracoidea hallerianae* (Anthracoideaceae), on *Carex halleriana* (Cyperaceae). Willdenowia 51(1): 57–67.

Dewey, C. 1846. Caricography. American Journal of Science and Arts, Series 2 (2): 245–249.

East, E. M. 1940. The distribution of self-sterility in the flowering plants. Proceedings of the American Philosophical Society 82(4): 449–518.

Ericson, L., J. J. Burdon and A. Wennström. 1993. Inter-specific host hybrids and phalacrid beetles implicated in the local survival of smut pathogens. Oikos 68(3): 393–400.

Everett, Marylee. 2000. *Carex polymorpha* Muhl. Variable sedge. Conservation and Research Plan prepared for the New England Wild Flower Society, Framingham, MA. 14 pp.

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. 1950. Gray's Manual of Botany. Dioscorides Press, Portland, OR. 1632 pp.

Fischer, George W. 1953. Smuts that parasitize grasses. USDA Yearbook of Agriculture 1953: 280–284.

Floden, Aaron J. and Edward E. Schilling. 2018. *Trautvetteria fonticalcarea* (Ranunculaceae: Ranunculeae), a new tassel rue species endemic to calcareous seepage habitats in Tennessee, USA. Nordic Journal of Botany 36(1–2): njb-01847.

Friedman, Jannice and Spencer H. C. Barrett. 2009. The consequences of monoecy and protogyny for mating in wind-pollinated *Carex*. New Phytologist 181: 489–987.

Gleason, H. A. and A. Cronquist. 1991. Manual of Vascular Plants of Northeastern United States and Adjacent Canada. Second Edition. The New York Botanical Garden, Bronx, NY. 910 pp.

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. 521 pp.

Hartley, Thomas G. 1960. Plant communities of the LaCrosse area In western Wisconsin. Proceedings of the Iowa Academy of Science 67(1): 174–188.

Hermann, Frederick J. 1938. New or otherwise interesting plants from Indiana. Rhodora 40(471): 77–86.

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.

Homoya, Michael A., D. Brian Abrell, Cloyce L. Hedge, and Roger L. Hedge. 1995. Additions to the flora of southern Indiana, V and VI. Proceedings of the Indiana Academy of Science 104(3-4): 213–221.

ITIS (Integrated Taxonomic Information System). Accessed August 6, 2024 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. [Maps generated from Kartesz, J. T. 2015. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP) (in press)].

Kauffman, Gary L., Guy L. Nesom, Alan S. Weakley, Thomas E. Govus, and Laura M. Cotterman. 2004. A new species of *Symphyotrichum* (Asteraceae) from a serpentine barren in western North Carolina. SIDA, Contributions to Botany 21(2): 827–839.

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 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.

Lynch, Elizabeth A., William R. Norris, Russell Kleinman, Deborah Q. Lewis, and Brian Kurtz. 2020. The flora of a mesic forest remnant in Iowa's Paleozoic Plateau. Castanea 85(2): 348–375.

Mackenzie, Kenneth Kent. 1910. Notes on *Carex* - VI. Bulletin of the Torrey Botanical Club 37(5): 231–250.

Mackenzie, Kenneth Kent. 1935. Cariceae. North American Flora 18(4): 169–240.

Martineau, Nate. 2020. Cover photo of *Carex woodii* from Michigan. Shared via iNaturalist at https://www.inaturalist.org/observations/48729315, licensed by https://creativecommons.org/licenses/by-nc/4.0/

Miller, Michael, Christopher I. Smith, Julie D. Jastrow, and James D. Bever. 1999. Mycorrhizal status of the genus *Carex* (Cyperaceae). American Journal of Botany 86(4): 547–553.

MNDNR (Minnesota Department of Natural Resources). 2024. *Carex woodii*. Rare Species Guide. Accessed August 9, 2024 at https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=PMCYP03EV0

Molano-Flores, Brenda, David N. Zaya, Jill Baty, and Greg Spyreas. 2019. An assessment of the vulnerability of Illinois' rarest plant species to climate change. Castanea 84(2): 115–127.

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. and John W. Thieret. 2000. Additions to the flora of Potter County, Pennsylvania. Bartonia 60: 117–120.

NatureServe. 2024. NatureServe Explorer [web application]. NatureServe, Arlington, VA. Accessed August 6, 2024 at https://explorer.natureserve.org/

Newhouse, Bruce, Richard Brainerd, Keli Kuykendall, Barbara Wilson and Peter Zika. 1995. Ecology of the Genus *Carex* in the Eastside Ecosystem Management Project Area. Report prepared for the Eastside Ecosystem Management Project, USDA Forest Service, Walla Walla, WA. Available at https://www.fs.fed.us/r6/icbemp/science/newhousebruce.pdf

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). 2019. List of Endangered Plant Species and Plant Species of Concern. Biotics Database. NatureServe, Arlington, Virginia. Accessed August 2019.

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

NJONLM (New Jersey Office of Natural Lands Management). 1992. Special Plants of New Jersey. New Jersey Department of Environmental Protection, Division of Parks and Forestry, Trenton, NJ. 22 pp.

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.

POWO. 2024. Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Accessed May 31, 2024 at http://www.plantsoftheworldonline.org/

Pusateri, William P., Dean M. Roosa, and Donald R. Farrar. 1993. Habitat and distribution of plants special to Iowa's Driftless Area. Journal of the Iowa Academy of Science 100(2): 29–53.

Reznicek, A. A. 1989. New England *Carex* (Cyperaceae): Taxonomic problems and phytogeographical considerations. Rhodora 91(865): 144–152.

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.

Rothrock, Paul E. 1997. The vascular flora of Fogwell Forest Nature Preserve, Allen County, Indiana. Proceedings of the Indiana Academy of Science 106: 267–290.

Rothrock, Paul E. and A. A. Reznicek. Page updated November 5, 2020. *Carex woodii* Dewey. In: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico [Online]. 22+ vols. New York and Oxford. Accessed August 8, 2024 at http://floranorthamerica.org/Carex_woodii

Savchenko, Kyrylo G., Matthias Lutz, Marcin Piatek, Vasyl P. Heluta, and Eviatar Nevo. 2013. *Anthracoidea caricis-meadii* is a new North American smut fungus on *Carex* sect. *Paniceae*. Mycologia 105(1): 181–193.

Standley, Lisa A. 1992. Symposium paper No. 1: Taxonomic issues in rare species protection. Symposium Proceedings - New England plant conservation: The scientific basis for effective action (July 1992). Rhodora 94(879): 218–242.

Standley, Lisa A. and Judith L. Dudley. 1991. Vegetative and sexual reproduction in the rare sedge, *Carex polymorpha* (Cyperaceae). Rhodora 93(875): 268–290.

Szakacs, Alexandria D., Alexander Krings, and Thomas R. Wentworth. 2022. Shade-tolerance classification of the upland herbaceous flora of the Carolina and Virginia Piedmont. The American Midland Naturalist 187(2): 113–147.

Thomas, Justin R. 2017. New additions, vouchers of old additions, and a new combination (*Dichanthelium inflatum*) for the Missouri flora. Missouriensis 34: 4–19.

Thorne, Robert F. 1956. Notes on rare Iowa plants - II. Proceedings of the Iowa Academy of Science 63(1): 214–227.

Tucker, G. E. 1972. The vascular flora of Bluff Mountain, Ashe County, North Carolina. Castanea 37(1): 2–26.

U. S. Army Corps of Engineers. 2020. National Wetland Plant List, version 3.5. https://cwbi-app.sec.usace.army.mil/nwpl_static/v34/home/home.html 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). 2024a. *Carex woodii* illustration from Britton, N. L. and A. Brown, 1913, An illustrated flora of the northern United States, Canada and the British Possessions, 3 vols., Kentucky Native Plant Society, New York, Scanned By Omnitek Inc. Image courtesy of The PLANTS Database (http://plants.usda.gov). National Plant Data Team, Greensboro, NC.

USDA, NRCS (U. S. Dept. of Agriculture, Natural Resources Conservation Service). 2024b. PLANTS profile for *Carex woodii* (Pretty Sedge). The PLANTS Database, National Plant Data Team, Greensboro, NC. Accessed August 6, 2024 at http://plants.usda.gov

Wahl, Herbert A. 1940. Chromosome numbers and meiosis in the genus *Carex*. American Journal of Botany 27(7): 458–470.

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.

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. 2023 pp.

White, David J. 2010. Plants of Lanark County, Ontario. 100 pp. Accessed May 31, 2024 at https://christielakeassociation.com/wp-content/uploads/Lanark_County_plants_revised_2010.pdf

Wolf, Amy T., Linda R. Parker, Gary Fewless, Kathryn Corio, Juniper Sundance, Heather Gentry, and Robert W. Howe. 2008. Impacts of summer versus winter logging on understory vegetation in the Chequamegon-Nicolet National Forest. Forest Ecology and Management 254(1): 35–45.

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(1): 15–22.