

Cinna latifolia

Slender Wood-reed

Poaceae



Cinna latifolia by Ian Shackelford, 2021

***Cinna latifolia* 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

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

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

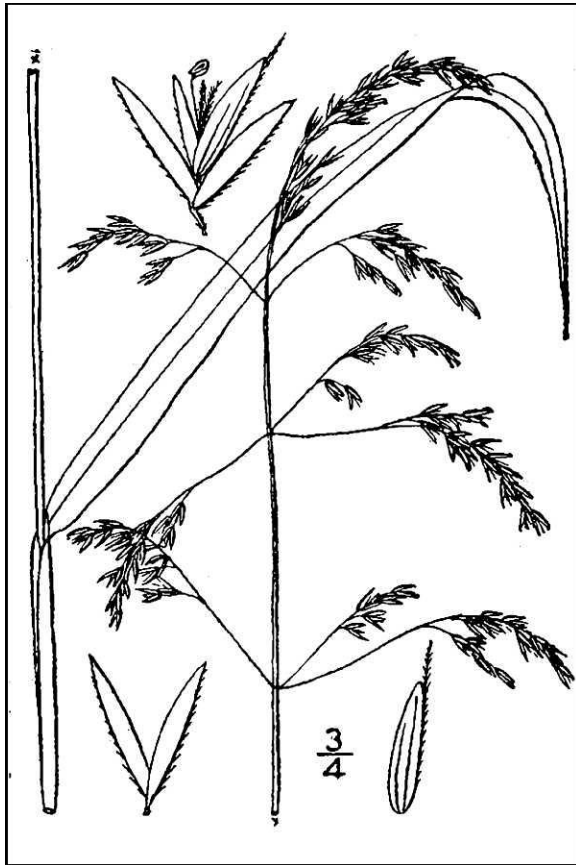
May, 2023

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. 2023. *Cinna latifolia* 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, Trenton, NJ. 19 pp.

Life History

Cinna latifolia (Slender Wood-reed) is a perennial grass that has short rhizomes and often grows in small tufts. The flowering culms are moderately tall, typically ranging between 5–15 dm in height but occasionally reaching 19 dm. Roots can sometimes develop at the lower stem nodes. The leaves are 1–20 mm wide and up to 28 cm long: They are flat and do not twist near the middle. The ligules are 2–8 mm long and colorless. The inflorescence of *C. latifolia* is a panicle up to 46 cm in length that has slender, spreading or drooping branches and usually nods at the top. The spikelets are single-flowered and no more than 4 mm long. Each floret has one stamen. The two glumes are nearly equal in length—both usually have a single vein, although sometimes the upper glume can have three. The lemma is slightly shorter than the glumes and typically has three veins, and when an awn is present it is less than 2.5 mm long. (See Britton and Brown 1913, Fernald 1950, Hitchcock 1950, Brandenburg et al. 1991, Gleason and Cronquist 1991, Delin 2015, Mittelhauser et al. 2019, Brandenburg 2021).



Left: Britton and Brown 1913, courtesy USDA NRCS 2023a.

Right: Peter M. Dziuk, 2017.

In some places *Cinna latifolia* starts to flower in June but in and around New Jersey flowering usually begins in July (Hough 1983, Rhoads and Block 2007, Weakley et al. 2022). A three-year study in northeastern Oregon found that the flowering period of *C. latifolia* usually lasted for about five weeks. The seeds began to develop several weeks after blooming and they ripened over a period of 15 days (Sampson 1917). In New Jersey the fruits may be present through October (Hough 1983), and stalks bearing the remains of inflorescences persist during the winter

months (Levine 1995). Young shoots on a tuft can sometimes remain green throughout the winter, even beneath a cover of snow (Delin 2015).

Only one other species of *Cinna* occurs in New Jersey: *C. arundinacea*. The upper glumes of *C. arundinacea* are usually strongly three-veined and the panicles are generally more erect than those of *C. latifolia*. The two species can be reliably distinguished by the size of their spikelets: The glumes of *Cinna latifolia* range from 2.5–4 mm in length while those of *C. arundinacea* are 4–6 mm long (Mittelhauser et al. 2019, Brandenburg 2021, Weakley et al. 2022).

Pollinator Dynamics

Wind is the prevalent mechanism for cross-fertilization of plants in the Poaceae (Culley et al. 2002, Garcia-Mozo 2017), and abiotic pollination has likewise been reported for *Cinna latifolia* (Wiegmann and Waller 2006). Some characteristics that facilitate wind pollination in the family include smooth, round pollen grains, a reduced perianth, and a limited number of ovules (Geisler 1945, Friedman and Barrett 2009). Geisler (1945) measured the pollen grains of *C. latifolia*, reporting a diameter range of 25–35 µm.

Self-incompatibility is common in wind-pollinated plants such as those in the Poaceae (Friedman and Barrett 2009) and it is particularly frequent in perennial grasses (Baumann et al. 2000). However, no specific information was found regarding the potential for self-fertilization in *Cinna latifolia*.

Seed Dispersal and Establishment

The fruits of *Cinna latifolia* are dry, one-seeded grains 1.8–2.8 mm in length that are released at maturity with the glumes still attached (Brandenburg et al. 1991, Brandenburg 2021). Delin (2015) observed that the shape formed by the grain and the angle of the glumes resembles that of a diving barn swallow. The seeds can be distributed in multiple ways, including by gravity, wind, water, or animals. The majority of grass seeds fall near the parent plants but both wind and post-ingestion dispersal are also common (Collins and Uno 1985, Cheplick 1998). Wind-dispersed propagules of Poaceae seldom travel far from the source plants, although the persistent glumes of *C. latifolia* might allow the seeds to move over a slightly greater distance (Rabinowicz and Rapp 1981). Older culms of *Cinna latifolia* that still retain some fruits often recline on the ground, making the seeds available to granivorous mammals or ground-foraging birds (Mladenoff 1990), and sometimes seedlings can be found sprouting near the tip of a prostrate stem from the previous year (Delin 2015). Delin additionally noted that *C. latifolia* seeds in streamside habitats were dispersed by water during periods of high flow.

Grass seeds are often a significant food source for birds during the winter (Collins and Uno 1985, Cheplick 1998). Orłowski et al. (2016) determined that when birds consumed high volumes of seeds they were more likely to excrete some propagules that were undigested and therefore viable, and they suggested that the effectiveness of avian dispersal had been underestimated. Hitchcock (1950) characterized *Cinna latifolia* as highly palatable, and edible

plants that retain seeds on mature plants where they may be ingested with foliage are well-suited for dispersal by large mammals (Janzen 1984). Flaherty et al. (2017) found that 42% of wetland plant seeds dispersed by White-tailed Deer (*Odocoileus virginianus*) were graminoid species, so post-consumption dispersal by deer is a possibility.

Once dispersed, *Cinna latifolia* seeds can sprout rapidly: Sampson (1917) reported that an average of 86.6% of the species' current seed crop germinated during a three-year study. Some *C. latifolia* seeds can also persist in the soil, forming a seed bank when circumstances are less favorable and germinating when conditions become suitable (Haeussler et al. 2002). Young *C. latifolia* plants mature rapidly, often producing fruit by the end of their first year (Huff 2009, Delin 2015).

Although mycorrhizae have not been reported in *Cinna latifolia* it seems likely that the plants are capable of forming fungal associations. Mycorrhizae have been documented in *C. arundinacea* (Cook and Lefor 1994), and Gabel and Gabel (2007) reported that *C. latifolia* was growing at two South Dakota sites which had particularly high fungal diversity and numerous types of ectomycorrhizal fungi. The latter study assessed overall abundance and variety of both fungi and plants but did not examine relationships between individual species.

Habitat

A shade-tolerance study by Humbert et al. (2007) identified *Cinna latifolia* as a species with broad amplitude, meaning that it was able to grow equally well in both shaded and open sites. Throughout its range, Slender Wood-reed has been found in forests, woodlands, swamps, thickets, bogs, and meadows at elevations of 0–2600 meters above sea level (Hough 1983, Halpern 1986, Angelo and Boufford 1998, Rhoads and Block 2007, Brandenburg 2021). Its habitats are usually moist or wet and include open bogs that are continuously recharged by groundwater (Bay 1967), saturated meadows (Halpern 1986), alluvial sites that are fairly well drained but seasonally inundated (Eis 1981), wet alder thickets (Huckaby and Moir 1998), and waterlogged forests (Volkova et al. 2018).

The forested sites where *Cinna latifolia* occurs can be comprised of either deciduous or evergreen species (Trass et al. 1999, Weakley et al. 2022). Breden et al. (2001) indicated that *C. latifolia* might occasionally be found in Northern Hardwood Forest (*Acer Saccharum*—*Betula allegheniensis*—*Fagus grandifolia* / *Viburnum lantanoides* Forest), an association that is relatively rare in New Jersey. The state's only extant population of *C. latifolia* occurs in a site that is deeply shaded by hemlocks (*Tsuga canadensis*), and the grass grows along streamlets and in sphagnum wet depressions (NJNHP 2022). In other locations, evergreen canopies above Slender Wood-reed may be dominated by *Abies balsamea* (Adams et al. 1920), *Picea mariana* (Bay 1967), or *Thuja occidentalis* (Wetmore 2001). The herb-dominated communities where *Cinna latifolia* occurs are also diverse. In glades, meadows and waterside sites the prevailing species may be other graminoids such as *Glyceria striata* or *Carex amplifolia* (Halpern 1986, Flinn et al. 2008). *C. latifolia* has often been found growing amongst ferns and fern allies, including *Equisetum fluviatile*, *Athyrium filix-femina*, *Deparia acrostichoides*, *Matteuccia*

struthiopteris, *Osmunda regalis*, or *O. cinnamomea* (Nelson 1919, Halpern 1986, Flinn et al. 2008).

The microsite characteristics of sites where *Cinna latifolia* occurs are also quite variable. Some measurements taken in a central New York conifer swamp where the grass was a dominant component of the herb layer recorded a litter pH of 4.18, a soil pH of 4.88, and a mean depth to water table of 20.32 cm (Paratley and Fahey 1986). Data from another central New York location indicated that *C. latifolia* favored sites in low or moderate positions relative to the local water table with a limited cover of open water and high pH (Hall et al. 2001). Typical habitat for a number of populations in Superior National Forest was described as wet with pooled water at the surface (Wetmore 2001). In Sweden, *C. latifolia* sometimes grows on boulders where it is subject to periodic desiccation (Delin 2015).

In the Yukon Territory *Cinna latifolia* was found on retrogressive thaw slumps, which are gentle slopes formed by recently thawed permafrost soils. The local sediments are ice-rich and mean annual soil temperatures in the adjacent forest range from 1.4°C to -2.4°C (Bartleman et al. 2001). At another site in northern Canada located south of the permafrost line, mean surface soil temperatures recorded in a cutover area where *C. latifolia* was dominant were 12.4°C during August and 5.7°C in September (Jeffrey 1963). Some of the cooler habitats reported in the United States were adjacent to a snowmelt-fed mountain stream in Oregon (Nelson 1919) and near an ice cave in Iowa (Benson et al. 2006).

Cinna latifolia has frequently been linked with disturbance. It has been known to occur at high densities in forest gaps, recently cleared areas, and resource extraction sites (Jeffrey 1963, Mladenoff 1990, Angelo and Boufford 1998, Huff 2009, Kern et al. 2013). *C. latifolia* was reported as a colonizer on pumice plains created by the 1980 eruption of Mount St. Helens in Washington. The substrate was composed primarily of deep pumice, but contained a few large mudflows and numerous small erosion gullies (Wood and del Moral 1988). Colonies at disturbed sites may originate from animal or water-dispersed propagules, and at some locations they can regenerate from existing seed banks or bud-banks (Haussler et al. 2002). Because *C. latifolia* plants are able to produce seeds during their first year the species can spread quickly after establishing a small initial population (Huff 2009). Rapid proliferation of Slender Wood-reed is typically observed during the first few years that follow a disturbance, but the grass begins to decline as a shrub canopy develops (Beguín et al. 2009, Eis 1981). A long-term study following canopy removal found that *C. latifolia* increased in abundance during the first three years but growth was significantly suppressed by the eighth year and after 22 years the species was absent. However, in year 29 *C. latifolia* was found in a newly opened treefall gap where it had likely become reestablished from the seed bank (Delin 2015).

Wetland Indicator Status

Cinna latifolia is a facultative wetland species, meaning that it usually occurs in wetlands but may occur in nonwetlands (U. S. Army Corps of Engineers 2020).

USDA Plants Code (USDA, NRCS 2023b)

CILA2

Coefficient of Conservancy (Walz et al. 2020)

CoC = 9. 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

Cinna latifolia is native throughout much of the northern hemisphere, including parts of North America, Europe, and Asia (POWO 2023). Although Slender Wood-reed is a morphologically variable species there are no consistent differences between Eurasian and North American plants (Brandenberg et al. 1991). The map in Figure 1 depicts the extent of *C. latifolia* in North America.

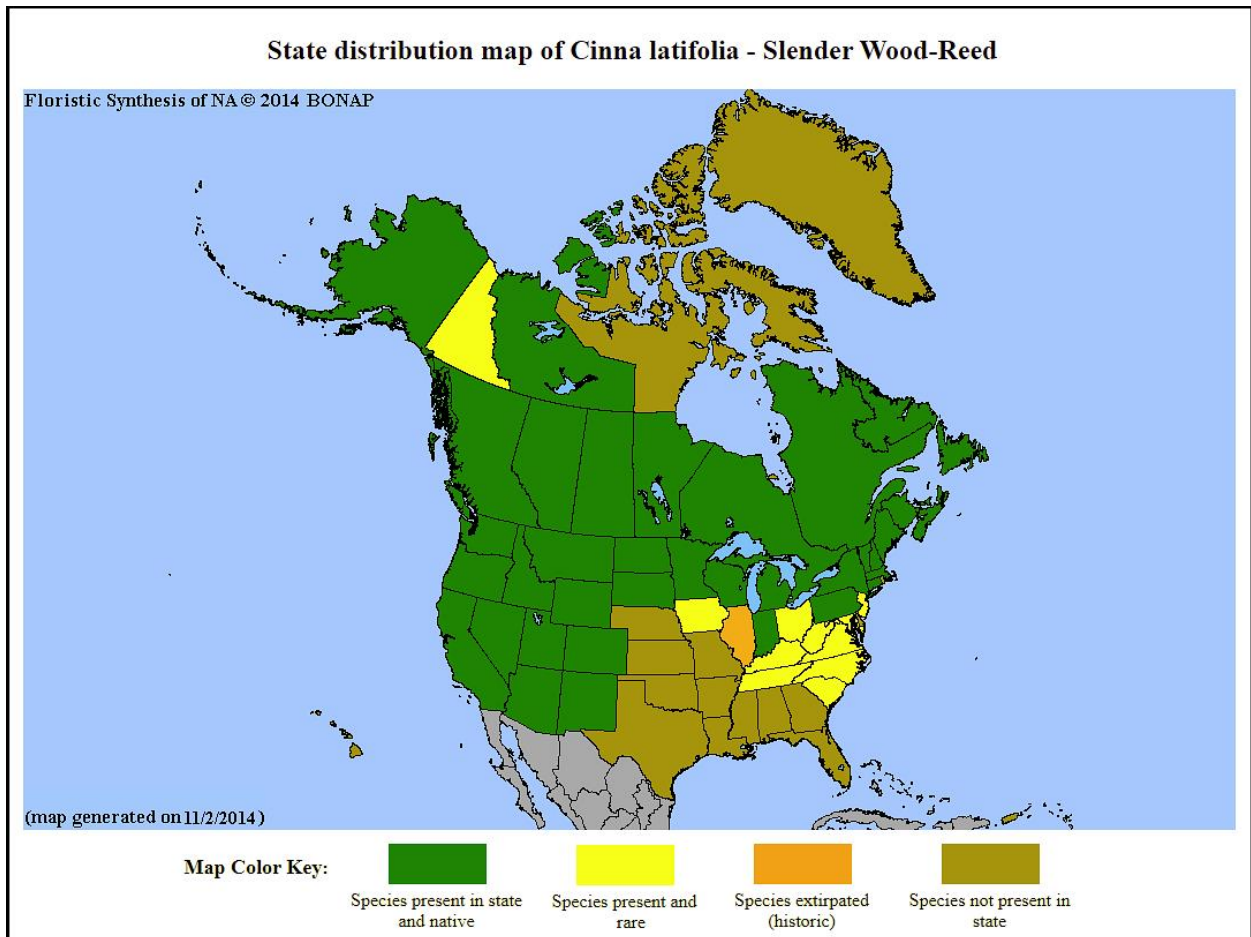


Figure 1. Distribution of *C. latifolia* in North America, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2023b) shows records of *Cinna latifolia* in two New Jersey counties: Passaic and Sussex (Figure 2 below). The data include historic observations and do not reflect the current distribution of the species.

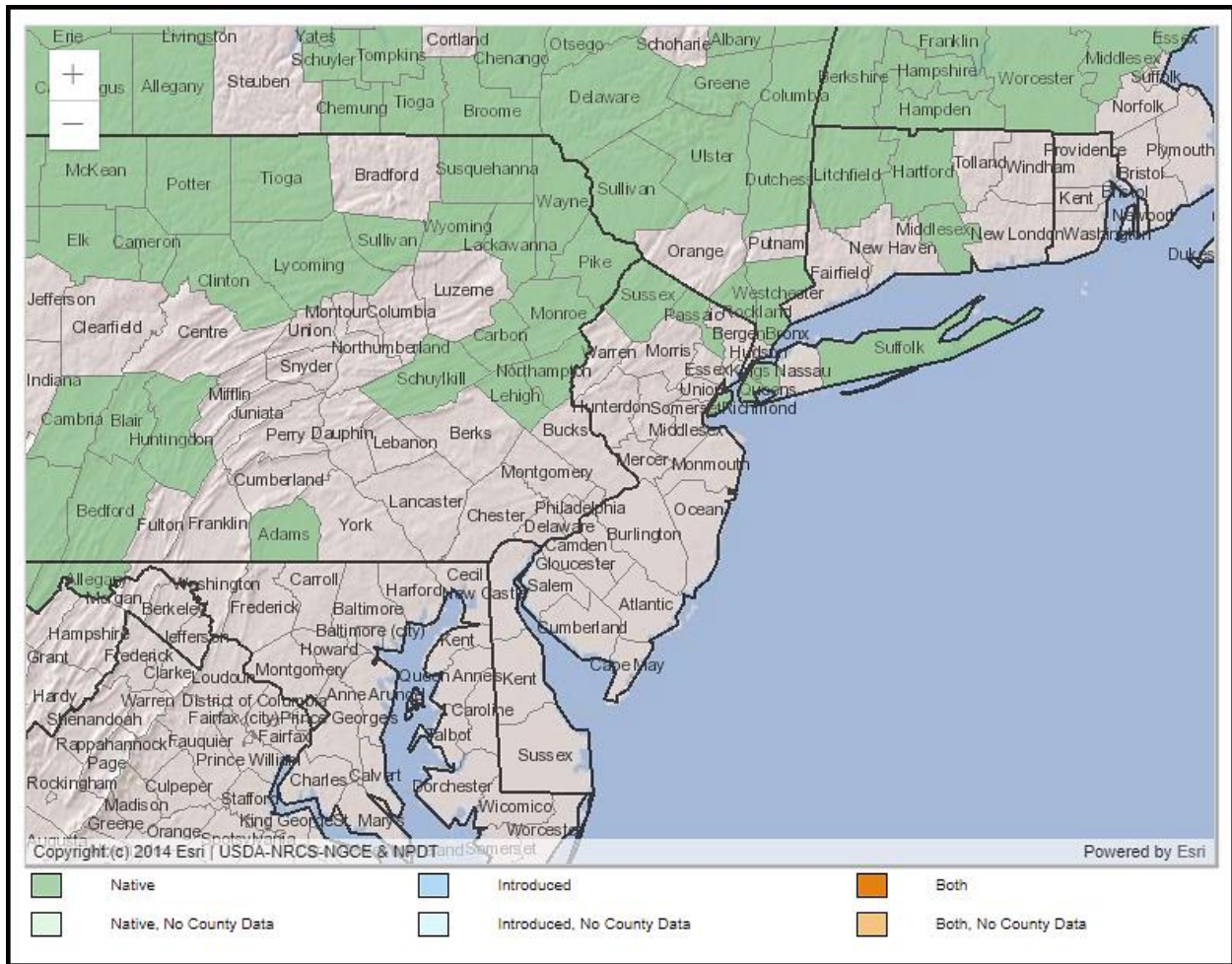


Figure 2. County records of *C. latifolia* in New Jersey and vicinity (USDA NRCS 2023b).

Conservation Status

Cinna latifolia 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 2023). The map below (Figure 3) illustrates the conservation status of *C. latifolia* throughout North America. Slender Wood-reed is vulnerable (moderate risk of extinction) in one province and two states, imperiled (high risk of extinction) in one state, critically imperiled (very high risk of extinction) in three states, and presumed extirpated in Illinois. *C. latifolia* is unranked in many states where it occurs and is considered secure or apparently secure in the majority of Canadian provinces.

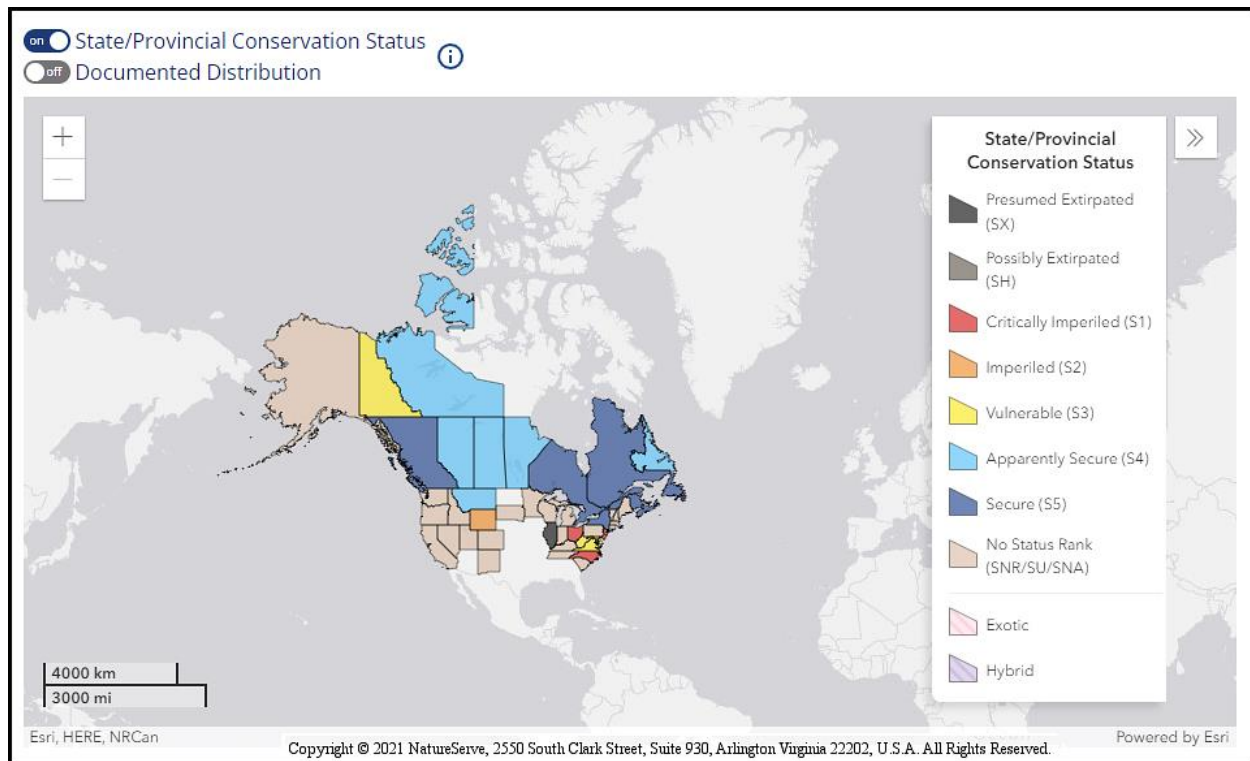


Figure 3. Conservation status of *C. latifolia* in North America (NatureServe 2023).

New Jersey is one of the states where *Cinna latifolia* is critically imperiled (NJNHP 2022). 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. latifolia* 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 grass 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).

A single occurrence of *Cinna latifolia* in Sussex County was reported by Taylor (1915), but during the early 1980s Hough (1983) indicated that records of the species from both Sussex and Passaic County were relatively recent. Only one occurrence of *C. latifolia* is currently known to be extant in the state. It might be the same population cited by Taylor but there is inadequate information about the original location to make a determination (NJNHP 2022).

Threats

No threats to New Jersey's population of *Cinna latifolia* were noted when the occurrence was last observed, but some populations of Slender Wood-reed at other locations have declined following habitat changes. Perhaps the most unusual threat reported was the presence of heron rookeries. A Minnesota study determined that *C. latifolia* rarely occurred directly below nests where the

greatest depositions of excrement were found, although it was frequent in adjacent woodlands. Soils with heavy concentrations of guano were slightly higher in nutrients and lower in pH than nearby soils when sampled during the winter, and the differences were likely to be greater during summer when the birds were present (Weseloh and Brown 1971).

Forest management activities—including thinning, clear-cutting, and burning—appear to have short-term benefits for *Cinna latifolia*. As discussed in the Habitat section, *C. latifolia* can quickly become abundant following a disturbance that opens the canopy. An evaluation of management practices in Minnesota found that the grass showed a positive response to both burning and brush-hogging and was one of the dominant graminoids in fire-treated plots (Host 1994). However, the successional trajectory that follows a disturbance can eventually make a site less suitable for *C. latifolia*. Slender Wood-reed disappeared from an Oregon *Tsuga* forest following a thinning which significantly increased the growth of the remaining trees, resulting in a dense, continuous overstory canopy (Alaback and Herman 1988). A similar result was reported after the clear-cutting of a *Picea* forest in Sweden: Following an initial increase, *C. latifolia* was eventually crowded out by dense growth of other herbaceous and woody species (Delin 2015). Consequently, it appears that competition is a threat to *Cinna latifolia*. Light availability does not seem to be limiting for the species, as it can grow in dense shade below mature evergreen trees. Disappearances of *C. latifolia* following rapid growth in understory communities might be due to reduced availability of belowground resources such as nutrients or beneficial fungi.

A number of fungal diseases have been reported in *Cinna latifolia*, including leaf blotches (*Scolecotrichum graminis*, *Stagonospora arenaria*) and rusts (*Puccinia coronata*, *P. graminis*) (USDA DMDS 1936, 1942). *Acremonium* species were also documented in herbarium specimens of *C. latifolia* but the specific fungi were not identified. *Acremonium* is a large genus, and while some species are detrimental to hosts others are not (White et al. 1993). The leaf blotch fungi are generally restricted to the leaves, sheaths, and culms of the host plants. Damage is usually limited, although severe infections can reduce a plant's photosynthetic capacity (Sprague 1941, UIE 2002). The rust fungi may be more harmful. *Puccinia* species have a life cycle that requires alternate hosts, which are barberries (*Berberis* spp.) for *P. graminis* and buckthorns (*Rhamnus* spp., *Frangula* spp.) for *P. coronata*. Severe infections of *P. graminis* often curtail fruit development in its graminoid hosts (Leonard and Szabo 2005). There are numerous forms of *P. coronata* with varying levels of virulence, some of which are known to cause significant grain losses (Berlin et al. 2018), but no form was specified when the fungus was reported on *C. latifolia*.

Like most understory plant species in northern New Jersey, *Cinna latifolia* is likely to be browsed by White-tailed Deer. Sampson (1917) underscored the species' favorability to herbivores, pointing out that "since it remains green and tender throughout nearly the entire summer grazing season, the herbage is closely consumed." However, *Cinna latifolia* is reportedly tolerant of deer browsing (Beguin et al. 2011), and that tolerance was cited as a probable factor in the increased abundance of the grass in northern Wisconsin and northwest Michigan during the past half century (Wiegmann and Waller 2006). Many graminoids minimize their susceptibility to deer by regrowing from a basal meristem after they have been browsed (Begley-Miller et al. 2014). Deer are not the only potential herbivores of *C. latifolia*. A

population studied by Delin (2015) was decimated by voles, which consumed nearly all of the leaves and stems in a stand one year. Fortunately, the grass had already shed its seeds so the colony persisted. The impact of herbivory on an individual occurrence of *C. latifolia* is likely to depend on the timing of the event.

Shifting climactic conditions in New Jersey are resulting in higher temperatures, more frequent and intense precipitation events, and increasing periods of drought (Hill et al. 2020). None of the currently available information about *Cinna latifolia* suggests that the species will be particularly vulnerable to the predicted changes. *C. latifolia* is known to tolerate periods of both inundation (Eis 1981) and drought (Delin 2015). Sampson (1917) observed that low soil moisture could lead to wilting or stem loss, and Redmann (1985) ranked the species as relatively low in drought tolerance, assigning it a 7 on a scale of 1 (very tolerant) to 10 (intolerant) on the basis of habitats where it had been observed. However, Delin (2015) reported that Slender Wood-reed could persist through dry periods and that stems lost to drought were replaced by fresh shoots after normal moisture levels were restored. A climate change risk assessment in Finland concluded that the vulnerability of *C. latifolia* was primarily due to interactions between existing threats from land use and the projected magnitude of climate change at sites where populations were present (Heikkinen et al. 2021), but no individual species characteristics were noted as contributing to its susceptibility.

Cinna latifolia is widely distributed throughout the northern hemisphere but reaches the southern end of its range in the United States (POWO 2023). Most of the information available regarding the species' climactic affinities has been derived from northern sites and no studies of heat tolerance were found. It is possible that the southernmost *C. latifolia* populations are restricted to sites at high elevations where cooler temperatures prevail, as suggested by Figure 4. If that proves to be the case, more populations throughout the country are likely to become vulnerable as the global climate continues to warm.

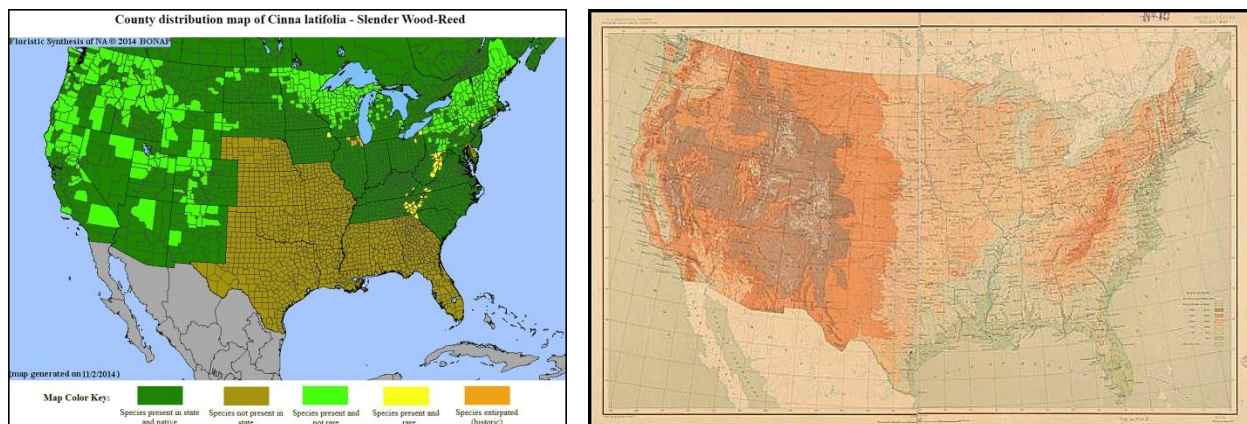


Figure 4. Comparison of county-level distribution of *C. latifolia* in the United States (Kartesz 2015, left) and the regional topography (USGS 1910, right).

Management Summary and Recommendations

No management requirements have been identified for the New Jersey population of *Cinna latifolia*, but the occurrence was last observed 15 years ago and an updated assessment is called for. In states where the species is imperiled, periodic disturbances may benefit *C. latifolia* populations by creating opportunities for regeneration and seed bank replenishment. Fire might be a suitable tool for habitat management (Host 1994) but more information is needed. Krefting and Ahlgren (1974) found that *C. latifolia* was absent on two burned sites and present (although not abundant) on an unburned site. Pre-fire data was not available for the burned sites so the observation was not indicative of a negative impact on the grass, but research is recommended to clarify the most beneficial fire intensity and timing for *C. latifolia*.

There are several other areas where additional research could enhance understanding about the ways in which *Cinna latifolia* relates to the environment. Examples include mycorrhizal associations or resource limitations that determine the outcome of competitive interactions with other plant species. As noted in the previous section, knowing the upper temperature limits that can be tolerated by *C. latifolia* would provide a better basis for evaluation of its vulnerability to climate change. It would also be interesting to investigate variation within the species to see whether populations in drier habitats or those near range edges have developed any particular adaptations to local conditions.

Synonyms

The accepted botanical name of the species is *Cinna latifolia* (Trevir. ex Göpp.) Griseb. Orthographic variants, synonyms, and common names are listed below (ITIS 2021, POWO 2023, USDA NRCS 2023b).

Botanical Synonyms

Agrostis alba var. *koreensis* Nakai
Agrostis latifolia Trevir. ex Göpp.
Agrostis suaveolens Blytt ex Sommerf.
Blyttia suaveolens (Blytt ex Sommerf.) Fr.
Cinna arundinacea var. *pendula* (Trin.) A. Gray
Cinna expansa Link
Cinna kamtschatica Rupr.
Cinna latifolia var. *glomerata* Scribn. ex Beal
Cinna pendula Trin.
Cinna pendula var. *acutiflora* Vasey ex Macoun
Cinna pendula var. *glomerula* Scribn.
Cinna pendula var. *glomerulata* Macoun
Cinna pendula var. *mutica* Vasey
Cinna suaveolens (Blytt ex Sommerf.) Fries in Schouw
Cinna suaveolens (Blytt ex Sommerf.) Rupr.
Muhlenbergia baicalensis Trin. ex Turcz.

Common Names

Slender Wood-reed
Drooping Woodreed

Muhlenbergia pendula Trin.

References

Adams, Charles C. , George P. Burns, T. L. Hankinson, Barrington Moore, and Norman Taylor. 1920. Plants and animals of Mount Marcy, New York, Part II. *Ecology* 1(3): 204–233.

Alaback, Paul B. and F. R. Herman. 1988. Long-term response of understory vegetation to stand density in *Picea-Tsuga* forests. *Canadian Journal of Forest Research* 18(12): 1522–1530.

Angelo, Ray and David E. Boufford. 1998. Atlas of the flora of New England: Poaceae. *Rhodora* 100(902): 101–233.

Bartleman, A.-P., K. Miyanishi, C. R. Burn, and M. M. Côté. 2001. Development of vegetation communities in a retrogressive thaw slump near Mayo, Yukon Territory: A 10-year assessment. *Arctic* 54(2): 149–156.

Baumann, Ute, Juan Juttner, Xueyu Bian, and Peter Langridge. 2000. Self-incompatibility in the grasses. *Annals of Botany* 85(Supplement): 203–209.

Bay, Roger R. 1967. Ground water and vegetation in two peat bogs in northern Minnesota. *Ecology* 48(2): 308–310.

Begley-Miller, Danielle R., Andrew L. Hipp, Bethany H. Brown, Marlene Hahn, and Thomas P. Rooney. 2014. White-tailed deer are a biotic filter during community assembly, reducing species and phylogenetic diversity. *AoB PLANTS* 6: doi:10.1093/aobpla/plu030.

Beguin, Julien, David Pothier, and Marcel Prévost. 2009. Can the impact of deer browsing on tree regeneration be mitigated by shelterwood cutting and strip clearcutting? *Forest Ecology and Management* 257: 38–45.

Beguin, Julien, David Pothier, and Steeve D. Côte. 2011. Deer browsing and soil disturbance induce cascading effects on plant communities: a multilevel path analysis. *Ecological Applications* 21(2): 439–451.

Benson, Thomas J., James J. Dinsmore, and William L. Hohman. 2006. Changes in land cover and breeding bird populations with restoration of riparian habitats in east-central Iowa. *Journal of the Iowa Academy of Science* 113(1–2): 10–16.

Berlin, Anna, A.-C. Wallenhammar, and B. Andersson. 2018. Population differentiation of *Puccinia coronata* between hosts –implications for the epidemiology of oat crown rust. *European Journal of Plant Pathology* 152: 901–907.

Brandenberg, David M. Page updated December 3, 2021. *Cinna latifolia* (Trevir. ex Göpp.) Griseb. In: Flora of North America Editorial Committee, eds. 1993+. *Flora of North America*

North of Mexico [Online]. 22+ vols. New York and Oxford. Accessed May 16, 2023 at http://floranorthamerica.org/Cinna_latifolia

Brandenburg, David M., Will H. Blackwell, and John W. Thieret. 1991. Revision of the genus *Cinna* (Poaceae). *SIDA, Contributions to Botany* 14(4): 581–596.

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.

Cheplick, Gregory P. 1998. Seed dispersal and seedling establishment in grass populations. In G. F. Cheplick (ed.). *Population Biology of Grasses*. Cambridge University Press, Cambridge, United Kingdom. 412 pp.

Collins, Scott L. and Gordon E. Uno. 1985. Seed predation, seed dispersal, and disturbance in grasslands: A comment. *American Naturalist* 125(6): 866–872.

Cooke, John C. and Michael William Lefor. 1994. Wetland Mitigation: Mycorrhizal associations in some Connecticut wetland plants. Volume Three of Six. Report JHR 94-288, prepared for the Connecticut Department of Transportation, Rocky Hill, CT. 73 pp.

Culley, Theresa M., Stephen G. Weller, and Ann K. Sakai. 2002. The evolution of wind pollination in angiosperms. *Trends in Ecology and Evolution* 17(8): 361–369.

Delin, A. 2015. Can *Cinna latifolia* survive clear-cutting? *Svensk Botanisk Tidskrift* 109(1): 18–27.

Dziuk, Peter M. 2017. *Cinna latifolia*. Image courtesy of Minnesota Wildflowers, <https://www.minnesotawildflowers.info/grass-sedge-rush/drooping-woodreed>, licensed by <https://creativecommons.org/licenses/by-nc-nd/3.0/>.

Eis, S. 1981. Effect of vegetative competition on regeneration of white spruce. *Canadian Journal of Forest Research* 11(1): 1–8.

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

Fernald, M. L. 1950. *Gray's Manual of Botany*. Dioscorides Press, Portland, OR. 1632 pp.

- Flaherty, Kelley A., James S. Rentch, and James T. Anderson. 2017. Wetland seed dispersal by white-tailed deer in a large freshwater wetland complex. *AoB PLANTS* 10(1): doi: 10.1093/aobpla/plx074
- Flinn, Kathryn M., Martin J. Lechowicz, and Marcia J. Waterway. 2008. Plant species diversity and composition of wetlands within an upland forest. *American Journal of Botany* 95(10): 1216–1224.
- Friedman, Jannice and Spencer C. H. Barrett. 2009. Winds of change: New insights on the ecology and evolution of pollination and mating in wind-pollinated plants. *Annals of Botany* 103(9): 1515–1527.
- Gabel, A. C. and M. L. Gabel. 2007. Comparison of diversity of macrofungi and vascular plants at seven sites in the Black Hills of South Dakota. *The American Midland Naturalist* 157(2): 258–296.
- García-Mozo, H. 2017. Poaceae pollen as the leading aeroallergen worldwide: A review. *Allergy* 72: 1849–1858.
- Geisler, Florence. 1945. A pollen study of thirty-two species of grasses. *Butler University Botanical Studies* 7(6): 65–73.
- 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.
- Haussler, S., L. Bedford, A. Leduc, Y. Bergeron, and J. M. Kranabetter. 2002. Silvicultural disturbance severity and plant communities of the southern Canadian boreal forest. *Silva Fennica* 36(1): 307–327.
- Hall, Brian R., Dudley J. Raynal, and Donald J. Leopold. 2001. Environmental influences on plant species composition in ground-water seeps in the Catskill Mountains of New York. *Wetlands* 21(1): 125–134.
- Halpern, Charles B. 1986. Montane meadow plant associations of Sequoia National Park, California. *Madroño* 33(1): 1–23.
- Heikkinen, Risto K., Linda Kartano, Niko Leikola, Juha Aalto, Kaisu Aapala, Saija Kuusela, and Raimo Virkkala. 2021. High-latitude EU Habitats Directive species at risk due to climate change and land use. *Global Ecology and conservation* 28: e01664.
- 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.

Hitchcock, A. S. 1950. Manual of the Grasses of the United States. Two Volumes. Second Edition, revised by Agnes Chase. Dover Publications, New York. 1051 pp.

Host, George E. 1994. Floristic differences in permanent openings among ecological land units after fire. NRRI Technical Report NRRI/TR-94-04, Natural Resources Research Institute, Duluth, MN. 33 pp.

Hough, Mary Y. 1983. New Jersey Wild Plants. Harmony Press, Harmony, NJ. 414 pp.

Huckaby, Laurie Stroh and W. H. Moir. 1998. Forest communities at Fraser Experimental Forest, Colorado. The Southwestern Naturalist 43(2): 204–218.

Huff, Valerie. 2009. From Reclamation to Restoration: Native Grass Species for Revegetation in Northeast British Columbia. Master's Thesis, University of Victoria, Victoria, British Columbia. 218 pp.

Humbert, Lionel, Daniel Gagnon, Daniel Kneeshaw, and Christian Messier. 2007. A shade tolerance index for common understory species of northeastern North America. Ecological Indicators 7: 195–207.

ITIS (Integrated Taxonomic Information System). Accessed November 13, 2021 at <http://www.itis.gov>

Janzen, D. H. 1984. Dispersal of small seeds by big herbivores: Foliage is the fruit. American Naturalist 123: 338–353.

Jeffrey, W. W. 1963. Soil temperature measurements in forests of northwestern Canada. Ecology 44(1): 151–153.

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)].

Kern, Christel C., Rebecca A. Montgomery, Peter B. Reich, and Terry F. Strong. 2013. Canopy gap size influences niche partitioning of the ground-layer plant community in a northern temperate forest. Journal of Plant Ecology 6(1): 101–112.

Krefting, Laurits W. and Clifford E. Ahlgren. 1974. Small mammals and vegetation changes after fire in a mixed conifer-hardwood forest. Ecology 55(6): 1391–1398.

Leonard, Kurt J. and Les J. Szabo. 2005. Stem rust of small grains and grasses caused by *Puccinia graminis*. Molecular Plant Pathology 6(2): 99–111.

Levine, Carol. 1995. A Guide to Wildflowers in Winter. Yale University Press, New Haven, CT. 329 pp.

Mittelhauser, G. H., M. Arsenault, D. Cameron, and E. Doucette. 2019. Grasses and Rushes of Maine: A Field Guide. The University of Maine Press, Orono, Maine. 747 pp.

Mladenoff, David J. 1990. The relationship of the soil seed bank and understory vegetation in old-growth northern hardwood–hemlock treefall gaps. *Canadian Journal of Botany* 68(12): 2714–2721.

NatureServe. 2023. NatureServe Explorer [web application]. NatureServe, Arlington, VA. Accessed May 16, 2023 at <https://explorer.natureserve.org/>

Nelson, J. C. 1919. Another "freak" *Equisetum*. *American Fern Journal* 9(4): 103–106.

NJNHP (New Jersey Natural Heritage Program). 2010. Special Plants of NJ - Appendix I - Categories & Definitions. Site updated March 22, 2010. Available at https://nj.gov/dep/parksandforests/natural/docs/nhpcodes_2010.pdf

NJNHP (New Jersey Natural Heritage Program). 2022. Biotics 5 Database. NatureServe, Arlington, VA. Accessed February 1, 2022.

Orłowski, Grzegorz, Joanna Czarnecka, Artur Goławski, Jerzy Karg, and Marek Panek. 2016. The effectiveness of endozoochory in three avian seed predators. *Journal of Ornithology* 157: 61–73.

Paratley, Robert D. and Timothy J. Fahey. 1986. Vegetation-environment relations in a conifer swamp in central New York. *Bulletin of the Torrey Botanical Club* 113(4): 357–371.

POWO. 2023. Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Accessed May 16, 2023 at <http://www.plantsoftheworldonline.org/>

Rabinowitz, Deborah and Jody K. Rapp. 1981. Dispersal abilities of seven sparse and common grasses from a Missouri prairie. *American Journal of Botany* 68(5): 616–624.

Redmann, R. E. 1985. Adaptation of grasses to water stress - Leaf rolling and stomate distribution. *Annals of the Missouri Botanical Garden* 72(4): 833–842.

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

Sampson, Arthur W. 1917. Important range plants: Their life history and forage value. USDA Bulletin No. 545, Washington, D. C. 63 pp.

Shackleford, Ian. 2021. Cover photo of *Cinna latifolia* from Michigan. Shared via iNaturalist at <https://www.inaturalist.org/observations/88776279>, licensed by <https://creativecommons.org/licenses/by-nc/4.0/>

Sprague, Roderick. 1941. *Stagonospora arenaria* on grasses. *Mycologia* 33(4): 371–379.

Taylor, Norman. 1915. Flora of the vicinity of New York - A contribution to plant geography. *Memoirs of the New York Botanical Garden* 5: 1–683.

Trass, Hans, Kai Vellak, and Nele Ingerpuu. 1999. Floristical and ecological properties for identifying primeval forests in Estonia. *Annales Botanici Fennici* 36: 67–80.

UIE (University of Illinois Extension). 2002. Brown Stripe or Leaf Streak of Forage Grasses. Reports on Plant Diseases, accessed May 18, 2023 at <http://ipm.illinois.edu/diseases/series300/rpd310/>

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 DMDS (U. S. Department of Agriculture, Division of Mycology and Disease Survey). 1936. A Preliminary List of the Parasitic Fungi of Ohio. *The Plant Disease Reporter*, Supplement 95.

USDA DMDS (U. S. Department of Agriculture, Division of Mycology and Disease Survey). 1942. Host and Pathogen Index to the Diseases Observed on Grasses in Certain Western States During 1941. *The Plant Disease Reporter*, Supplement 137.

USDA, NRCS (U. S. Dept. of Agriculture, Natural Resources Conservation Service). 2023a. *Cinna latifolia* 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). 2023b. PLANTS profile for *Cinna latifolia* (Drooping Woodreed). The PLANTS Database, National Plant Data Team, Greensboro, NC. Accessed May 16, 2023 at <http://plants.usda.gov>

USGS (U. S. Geological Survey). 1910. Relief map of the United States. Image courtesy of Wikimedia Commons, licensed by <https://creativecommons.org/licenses/by/2.0/>

Volkova, Polina A., Maria O. Ivanova, and Liudmila A. Abramova. 2018. One for all: Can individual plant species indicate the overall number of plant species? *Evolutionary Ecology Research* 19: 209–213.

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. 2022. Flora of the Southeastern United States. University of North Carolina Herbarium, North Carolina Botanical Garden, Chapel Hill, NC. 2022 pp.

Weseloh, D. Vaughn and Robert T. Brown. 1971. Plant distribution within a heron rookery. *The American Midland Naturalist* 86(1): 57–64.

Wetmore, Clifford. 2001. Rare lichen habitats in Superior National Forest. USDA Forest Service PO # 43-63A9-1-3066. 20 pp.

White, J. F. Jr., G. Morgan-Jones, and A. C. Morrow. 1993. Taxonomy, life cycle, reproduction and detection of *Acremonium* endophytes. *Agriculture, Ecosystems and Environment* 44: 13–37.

Wiegmann, S. M. and D. M. Waller. 2006. Fifty years of change in northern upland forest understories: Identity and traits of “winner” and “loser” plant species. *Biological Conservation* 129(1): 109–123.

Wood, David M. and Roger del Moral. 1988. Colonizing plants on the Pumice Plains, Mount St. Helens, Washington. *American Journal of Botany* 75(8): 1228–1237.