

The Remarkable Adaptability of *Carex* Sedges: The True Sedges

The Cyperaceae (Sedge family) is the third largest family of vascular plants in Maryland, with 288 species, subspecies, and varieties, of which 264 are native and 24 are non-native (Knapp & Naczi 2021). Within the Cyperaceae, *Carex* stands out as its largest and most diverse lineage with more than 2,000 species worldwide and approximately 480 species occurring in North America (Ball & Reznicek 2002). *Carex* species are referred to as the “true sedges” because they show the full set of traits that define the sedge family more clearly than any other group: a solid and triangular stem and three-ranked leaves. *Carex* is distinguished from other sedge genera by the presence of a perigynium (a sac that encloses the ovary). The form of the perigynium varies greatly and is an important characteristic for species identification.

With 166 taxa in Maryland (Maryland Plant Atlas Work Group 2026), *Carex* is the most species-rich sedge genus and the largest genus of vascular plants in the state flora (Frye & Lea 2001; Knapp & Naczi 2021). The high diversity of *Carex* is the result of species having adapted to a wide variety of ecological conditions thus occupying a broad range of ecological niches.

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Ecological Adaptabilities of *Carex* in Maryland

In Maryland, *Carex* taxa occur in nearly every habitat imaginable, from urban lots and roadside ditches to fens, glades, barrens, and pristine wetlands. Some species are widespread across multiple of Maryland’s five Physiographic Provinces; others are tightly restricted to a single county, soil type, or geological formation. Sedges have adapted to deal with stress, disturbance, competition, and limited resource availability. The wide ranging geographical and ecological locations of *Carex* species in Maryland are a testament to *Carex*’s adaptability. A list of *Carex* and their distributions and associated habitats in Maryland is available at Frye and Lea 2001.

***Carex* of the Appalachian Plateau**

The most distinctive region for *Carex* diversity occurs on the Appalachian Plateau of western Maryland in Garrett County. The Appalachian Plateau hosts species that typically occur only in colder, previously glaciated regions well to our north. Their presence in Maryland indicates refugia where cold-adapted species survived postglacial warming in

peaty, nutrient-poor, saturated soils. The rarity of these ecosystems emphasizes their high conservation value.

The high elevation meadows and glades of Garrett County contain 14 species that are restricted to that province and occur nowhere else in Maryland. These are species of northern climates and their presence in Maryland is, for the most part, expected. Northern species like *Carex trisperma**, *Carex utriculata*, *Carex tuckermanii*, and *Carex echinata* occur in the fens and peaty sedge meadows of Garrett County, as might have been predicted. However, one species—*Carex diandra*, is particularly noteworthy because the range of the species had previously been thought to be the historically glaciated Northeast.

***Carex* of the Piedmont**

The geological complexity of Maryland’s Piedmont province offers plants great opportunities for diversification. Where unusual rock formations such as serpentine and diabase occur, grassland and savanna habitats can be found, along with species that are highly restricted and very rare. For example, Midwestern species like *Carex richardsonii*, *Carex hystericina*, and *Carex meadii* only occur in Maryland within the state’s serpentine and diabase barrens. We even

Salt meadow at Hooper’s Island, Dorchester County. Photo by C. Niciporciukas.



Chris Frye examining a *Carex* species at Chapman Forest Shell-Mark Ravine Forest. Photo by R.H. Simmons.

have one regional endemic variety, *Carex tetanica* var. *canbyi*, known from fewer than ten sites globally.

Sedges that grow on nutrient-poor, magnesium-rich, calcium-variable soils show how sedges can be geological specialists tied to rare substrates. Even *Carex interior*, common elsewhere, becomes a soil-restricted specialist in Maryland—a reminder that ecological suitability is more stressed at range margins. *Carex interior*, although ubiquitous throughout the Northeastern United States, requires the calcium-rich or ultramafic soils near the southern limits of its known range in Maryland. These kinds of habitat shifts are rare, but they do occur.

Carex of the Coastal Plain

Covering two-thirds of Maryland, the Atlantic Coastal Plain is a vast region of terrestrial and wetland habitats. It serves as a vital sanctuary for rare plant life, including many species of *Carex*. For example, *Carex vestita*, once a component of fire-maintained oak-pine savannas and woodlands, is now restricted almost entirely to roadsides and powerlines in Maryland, where sunlight is not limited and frequent mowing suppresses woody species. *Carex vestita* is an example of how fire suppression and land alteration can significantly alter sedge ecology and reveals how human disturbance can both threaten and inadvertently maintain a species. It is a clear example of a more modern distribution.

Seasonal wetland communities, known as Delmarva Bays, offer a unique assemblage of *Carex* species. *Carex striata*, a colonial (spreading by subterranean rhizomes) species often dominates these habitats up to 100 percent cover. Other species found in Delmarva Bays and other Coastal Plain wetlands include *Carex jorii*, *Carex glaucescens*, *Carex lupuliformis*, and *Carex gigantea*. These species are wetland specialists that define and structure entire ecosystems. They stabilize soils, regulate hydrology, and create habitat for invertebrates, amphibians, and other rare plants. These *Carex* sedges act as ecosystem engineers in isolated wetlands. Their presence also signals intact hydrology and high-quality wetland conditions.

Matrix-forming Carex in Wetlands and Meadows

Several *Carex* species form the matrix of herbaceous wetland glades and meadows in which all other plant species are embedded. These species are generally dominant and form dense clumps. One example is *Carex lacustris* with rare occurrences in tidal freshwater marshes on the Coastal Plain and high elevation peatlands in Garrett County—and no populations in between! Another example is *Carex utriculata* that grows in elliptical to circular clonal patches in mountain peatlands that may cover nearly an acre! Both species exhibit rare sexual reproduction. Among thousands of square meters of habitat, there may be very few inflorescences and of the perigynia that do occur, most will not contain a seed. This space-usurping ecological adaptation allows for large stands composed of just one or a few clones.

Other matrix species include *Carex woodii*, frequently a dominant plant in montane-alluvial forests in western Maryland, and *Carex hyalinolepis*, a sedge of tidal rivers and bald-cypress swamps in the lower Pocomoke River watershed. *C. hyalinolepis* occurs in populations containing thousands or tens of thousands of stems but is confined to those habitats and nowhere else in Maryland.



Carex lupuliformis (False Hop Sedge). Photo by N. DeBarros.



Carex lupuliformis (False Hop Sedge). Photo by N. DeBarros.



Carex interior (Inland Sedge). Soldier's Delight seepage wetland, Baltimore County. Photo by C. Frye.



Carex lacustris (Lake Sedge). Photo by N. DeBarros.



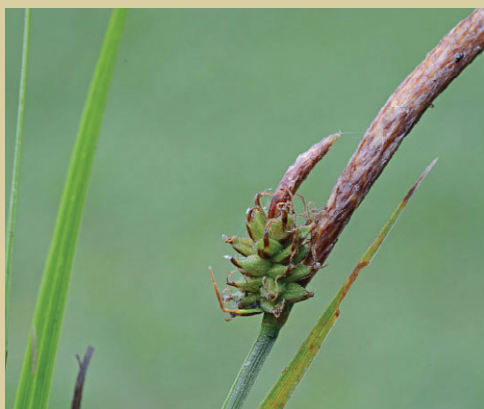
Carex woodii (Pretty Sedge) habitat at Black Sulphur Run, a montane alluvial floodplain, Ridge State Forest, Allegany County. Photo by C. Frye.



Carex meadii (Meade's Sedge). Photo by N. DeBarros.



Rhizomes of *Carex meadii* (Meade's Sedge). Photo by N. DeBarros.



Carex vestita (Velvet Sedge). Photo by G. P. Fleming.

The *Carex* species described above share a remarkably consistent ecological strategy built around clonal dominance, space capture, and long-term habitat stability. Although each species discussed occupies a different type of wetland, their growth patterns and population structures reveal a common foundational ecological role: they shape the habitat, define the community composition, and persist through time by occupying space more effectively than their competitors.

Carex as Architects

The growth patterns described above underscore the ecological centrality of *Carex* in Maryland's wetlands, forests, barrens, and tidal systems. Knowing where a *Carex* species is found and how it grows allows us to infer its climatic tolerances, soil chemistry preferences, hydrologic niche, disturbance dependencies, and role in community structure. In turn, mapping the distribution and habitats occupied by *Carex* species provides a wealth of ecological and environmental information. Understanding where and how *Carex* species occur in Maryland helps reveal which habitats are rare or threatened and therefore can inform conservation priorities. *Carex* distributions also provide insights into specific ecological conditions.

Follow this QR code for tips for keying out *Carex*.



Conservation Concerns

Threats to *Carex* mirror the pressures faced by other native plants and communities including agriculture, development, sea-level rise, fire suppression, and poor protection status. While we know where most sedge species grow and the conditions they require, comprehensive management strategies are lacking.

Many *Carex* species are also highly sensitive to hydrologic alteration, including changes in groundwater flow, ditching, or wetland drainage that can eliminate populations dependent on stable moisture regimes. This means developments, climate change, and sea level rise can kill off populations without ever being in direct contact with the ecosystem. Invasive species further complicate management by outcompeting native sedges in both upland and wetland habitats, especially where natural disturbance cycles, such as fire, have been disrupted. Taken together, these factors show that conserving *Carex* in Maryland requires not only protecting known populations but also restoring the ecological processes, especially fire and hydrology, that once sustained them.

Follow this QR code for the common names of all *Carex* species mentioned in the article.



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