

Native Cool-Season Grasses in

By Nadia Navarrete-Tindall

Although they may be overlooked, underestimated, unknown or simply ignored, native cool-season grasses are significant components of many plant communities in Missouri, including prairies, savannas, and woodlands.



Back in 1999, after 11 years in the Midwest, I had never heard of native cool-season grasses, or maybe I did not care. Grasses were like lower-class citizens in the plant world for me. Little did I know then how important they were for many natural communities.

I was looking for innovative research ideas on native plants when I was first introduced to cluster fescue (*Festuca paradoxa*) by Missouri Department of Conservation research biologist Larry Mechlin. Cluster fescue is a native cool-season bunch grass growing naturally in wet to mesic prairies as well as open woodlands. I knew about non-native tall fescue and other introduced grasses but nothing about native fescues! Larry and I visited Tucker Prairie near Kingdom City

in early spring where cluster fescue grows scattered but abundantly in the company of native warm-season grasses and wildflowers. After that visit, I realized that I had been looking at native cool-season grasses before but I had never really seen them. They were probably always part of what I considered the background!

While native warm-season grasses are the essential backbone of prairies, native cool-season grasses also fulfill an important ecological role on prairies and other natural communities, by providing food (forage and seeds) early in the growing season as well as cover for wildlife. By the time that cluster fescue, for example, has mature seeds in early July, warm-season grasses like little bluestem are developing vegetatively, completing their year's growth and seed production through summer and early fall. In the shade of tall grasses and forbs, cluster fescue remains green but dormant, resuming vegetative growth in the fall when native warm-season grasses and forbs are done with their yearly cycle.

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Missouri



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At Lincoln University's George Washington Carver Farm in Jefferson City, several species of native cool-season grasses grow in seed production plots. Pictured here is June grass with seed heads in June. It is an attractive addition to prairie gardens.

Native Cool-Season vs. Warm-Season Grasses

These two groups of plants differ in several ways. Native cool-season grasses are referred to as “C3 grasses” because, during photosynthesis, they use the Calvin-Benson cycle and produce three carbon molecules, while a C4 grass does not directly use the Calvin-Benson Cycle and produces a four-carbon molecule (Mader 1990). General differences between warm- and cool-season grasses are summarized in Table 1. These physiological differences allow native cool-season grasses to grow and reproduce in cooler conditions, offering forage in early spring, fall, and part of winter, and seed by early summer, while warm-season grasses continue growing when cool-season grasses are dormant. For more information on comparing these two groups of grasses consult Lynn (2004).

The two groups also differ in terms of habitat preference. Although warm-season grasses are mostly found in prairies, glades, and savannas (Yatskievych 1999), they also can be found in open woodlands and wet prairies overlapping habitats with native cool-season grasses, and conversely, some native cool-season grasses can be found growing under sunnier, drier conditions. For example, preliminary results of studies by Navarrete-Tindall and Van Sambeek (2010) show that poverty grass can grow well under full sunlight and moderate shade. When soil conditions are moist in spring, its growing season ends in July; however, under moderate shade, poverty grass can extend its growing season without the need of irrigation. This is good news for those who want to see more natives used for developed landscapes. More studies are needed on other species of native cool-season grasses to learn more about their potential use in both urban environments and rural landscapes.

Table 1.
Differences between native cool- and warm-season grasses in Missouri.

	Warm-season grasses	Cool-season grasses
Photosynthetic pathway	C4 pathway	C3 pathway
Temperature/Moisture Requirements	Hot and dry sites	Cool sites
Light requirements	Full sunlight to moderate shade	Prefer moderate shade Some grown under full sunlight
Vegetative growth	Late spring-early summer	Fall and spring
Blooming time	Summer	Spring
Seed matures	Fall	Early summer-early fall
Dormancy	Winter-early spring	Hottest summer periods Coldest winter periods
Habitat	Glades and prairies	Open woodlands, wet to mesic prairies

efforts to document that cluster fescue is more abundant on Missouri prairies and woodlands than may have been thought. It was found growing with other native cool-season grasses such as Canada and Virginia wild ryes, fowl manna grass, and June grass in moist sites at Paint Brush Prairie in Pettis County and in a restored open woodland at Lake of the Ozarks State Park (Navarrete-Tindall and Erickson 2003, Navarrete-Tindall et al. 2003).

To help solve the problem of native cool-season grass anonymity, the Native Plants Program at Lincoln University has been working with the University of Missouri Extension and the U.S.D.A. Forest Service. A small collection of native cool-season grasses, which includes grasses discussed in this article, has been established in native plant gardens and field demonstration plots at several locations at Lincoln University, Jefferson City, and the University of Missouri, Columbia. These grasses and other native plants can be seen by the public during field days or visited any time of the year. More species are being added as seed becomes available.

Seven Common Native Cool-Season Grasses

All seven of the species described below are perennials and grow in Missouri with a wide range of distribution elsewhere in the United States (Yatskievych 1999). All not only are important in their native habitats but are currently used—or have potential to be used—in native landscaping and in land restoration projects, such as the Virginia wild rye selection Cuivre River (*Elymus virginicus*) developed by the Plant Materials Center in Elsberry, Missouri (Henry et al. 2004).

An obstacle to cultivating these grasses for restoration and other landscaping projects is the limited amounts of their seeds that are commercially available. Natural stands of these grasses, however, can provide abundant seeds when sites are identified before seeds mature. The challenge is to help more people learn how to identify them in the field. For those unfamiliar with native cool-season grasses, the descriptions here provide a starting point. For a more complete description of these and other native cool-season grasses, consult Yatskievych (1999).

Look for the seedheads of these understated but prevalent native grasses this summer, and soon you will begin to see them in many natural communities across the state and even in your backyard.



River oats planted in swales and rain gardens helps prevent soil erosion.



Poverty grass with green inflorescences (established with prairie June grass in the background). Poverty grass leaves turn curly at the end of the growing season

Poverty grass (*Danthonia spicata*)

This is a bunch grass with no stolons or rhizomes, and with flowering stems 6 to 25" long. Leaves are basal 4 to 6" long and form rosettes. It can be propagated from seed and tillers (basal sprouts). Most seed can be harvested in early July. On-going studies show that poverty grass is best established in low fertility, dry, and rocky soils under moderate shade in lawns (Navarrete-Tindall and Van Sambeek 2010). It can provide cover for small mammals and small birds (Covington 2000); rabbits have been observed eating it in demonstration plots in mid-spring (personal observations).

River oats (*Chasmanthium latifolium*)

Clump-forming grass with rhizomes, wide, light-green leaves 3.5 to 11" long, and flowering stems 38 to 62" long. It can be propagated from seed and by plant division. It grows near streams, creeks, and bottomlands but can also grow in dry and sunny places. Seeds are eaten by quail. This grass is a host for Linda's roadside skipper (*Amblyscirtes linda*, Davis 2006). Seeds persist in panicles when collected green; seed heads are attractive in dried arrangements. River oats can be used to control erosion, but note that in gardens it may spread as it readily self-establishes from seeds (personal observation). Pruning the seed heads by fall would control this potential problem.



Fowl manna grass under full sunlight grows erect; it is shown here with seed heads in late May.

Fowl manna grass (*Glyceria striata*)

Clump-forming grass with spreading rhizomes and flowering stems 2 to 3' in height. Foliage is light green. It grows in full to partial sunlight and moist to wet soil. It can be found on stream banks and in sandy and loamy soil in woodlands and prairies. It is palatable to cattle, horses, sheep, and deer. It provides good wildlife cover, and waterfowl and other birds consume the seed (Darris 2006). It can easily be propagated from its highly viable seed and plant division. Several sources indicate that flour can be made from the seed of this and other *Glyceria* species.

About 49 (55 percent) of the 89 genera of grasses in Missouri are cool-season grasses, and most of them are native. Of the state's total species of native grasses (approximately 140 species), 23 percent (32) are native cool-season grasses.

Virginia wild rye (*Elymus virginicus*)

Bunch grass with 2 to 3' flowering stems and leaves 2 to 13.5" long. It can be propagated from seed and plant division. Like Canada wild rye, Virginia wild rye can be found in flood plains, pastures, glades, upland prairies, and bluffs. It differs from Canada wild rye in that the erect inflorescences are enclosed by the uppermost leaf sheath (Yatskievych 1999). Virginia wild rye can be used to feed livestock because of its high nutrition value (Reilley et al. 2002).



Cuivre River Virginia wild rye in winter.



Cluster fescue with green seed in mid-May.



Cluster fescue, to not be confused with non-native tall fescue pictured here, is a clump-forming grass. Tall fescue is sod-forming and very difficult to eradicate. Cluster fescue has a more slender appearance than tall fescue; it also has light green to yellowish green leaves, whereas tall fescue leaves are green to dark green and have a rougher appearance. For more on non-native tall fescue, see the *Missouri Prairie Journal*, 2009, Vol. 30 #4.

Cluster fescue (*Festuca paradoxa*)

Cluster fescue forms bunches and lacks rhizomes. Leaves are 4 to 10" long with flowering stems 20 to 50" long. Panicles droop at maturity. This grass is found scattered in Missouri. It is considered endangered in part of its range (Indiana, Maryland, and Pennsylvania). Its natural habitat includes upland prairies, prairie draws, forest openings, and glades (Yatskievych 1999). No reports were found regarding wildlife usage; however, insects and small spiders were observed on cluster fescue leaves during experimental trials in Missouri (personal observations). It is easily propagated from seed, and it has been observed to persist in restored prairies five to seven years after initial planting.



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June grass—shown here in bloom—is attractive spring through winter.

June grass (*Koeleria macrantha*)

Forms small clumps and lacks or has short rhizomes. Leaves upright to 8” long and flowering stems 8 to 24” long. This is an attractive, small grass used in native landscaping. It provides forage for livestock, deer, and elk. Its seeds provide food for upland game birds, small mammals, and numerous grasshoppers and leafhoppers (Ogle 2008). In Missouri, this grass is common in high quality prairies (Yatskievych 1999) and is rarely found in disturbed sites. Outside of Missouri, it also grows in rocky soils at high elevation where Bighorn sheep and mountain goats graze it (Ogle 2008). June grass is being tested as a low input turf grass in golf courses (Watkins and Clark 2009). It is propagated from seed.



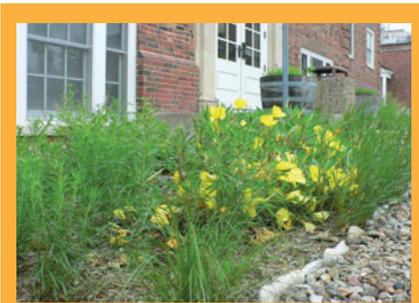
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Nodding seed heads of Canada wild rye.

Canada wild rye (*Elymus canadensis*)

Bunch grass that either lacks or has short rhizomes. This plant can be up to 4’ tall and flowering stems are 30 to 20” long with leaves 4 to 15” long. Inflorescences can be 3 to 15” long and arched or erect. It grows in similar habitats as Virginia wild rye. It offers forage as well as nesting and escape cover for wildlife (Bush 2002). It is used for conservation practices to control erosion and offers quality forage for livestock (Sanderson et al. 2004).

Native Plant Program at Lincoln University



One recent project of the Native Plant Program is this native garden on the Lincoln University campus in Jefferson City. The Missouri Prairie Foundation would like to acknowledge Lincoln University’s collaboration with us in promoting native prairie.

Researching and promoting the use of native cool-season grasses is one of the many projects of Lincoln University’s Native Plant Program, based in Jefferson City. The program also promotes the use of native plants for conservation to enhance biodiversity in rural and urban Missouri, and increases awareness about native plant potential as specialty crops to generate income for underserved audiences including minority small farmers, producers, landowners, and others.

To accomplish these goals, the Native Plants Program organizes and participates in seminars, workshops, and field days to offer training and hands-on demonstrations about topics related to native plants. This program works in close collaboration with the Missouri Prairie Foundation, the Natural Resources Conservation Service, the University of Missouri, Master Gardeners, and other environmental and educational institutions and organizations.

This program is developing nature outdoor laboratories that consist of a series of native plant gardens for education and enjoyment. Planned interpretive signs will include information addressing the importance of native plants for landscaping, wildlife habitat, medicine, food, and value-added products such as dyes and fibers. Bilingual (Spanish-English) brochures are being developed for each laboratory. The outdoor laboratories can be visited at three main locations: Lincoln University Campus at Allen and Foster Halls and Busby Farm in Jefferson City; Manheim Community Garden in Kansas City; and Martin Civic Center in Marshall.

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- MPF member and Native Plant Extension Specialist Nadia Navarrete-Tindall, Ph.D., is with Lincoln University Cooperative Research and Extension. She is developing Lincoln's Native Plants Program and Nature Outdoor Laboratories at Lincoln University Campus and the Civic Community Center in Marshall, MO, as well as other projects across the state. Nadia is interested in all aspects of native plants and works to promote their value-added potential (food, fibers, natural dyes) and their importance for balanced and healthy ecosystems in urban or rural environments. She lives in Columbia with her husband Randy Tindall, where they have created a work-in-progress sanctuary for wildlife at their home.