MISSOURI
PRAIRIE JOURNAL

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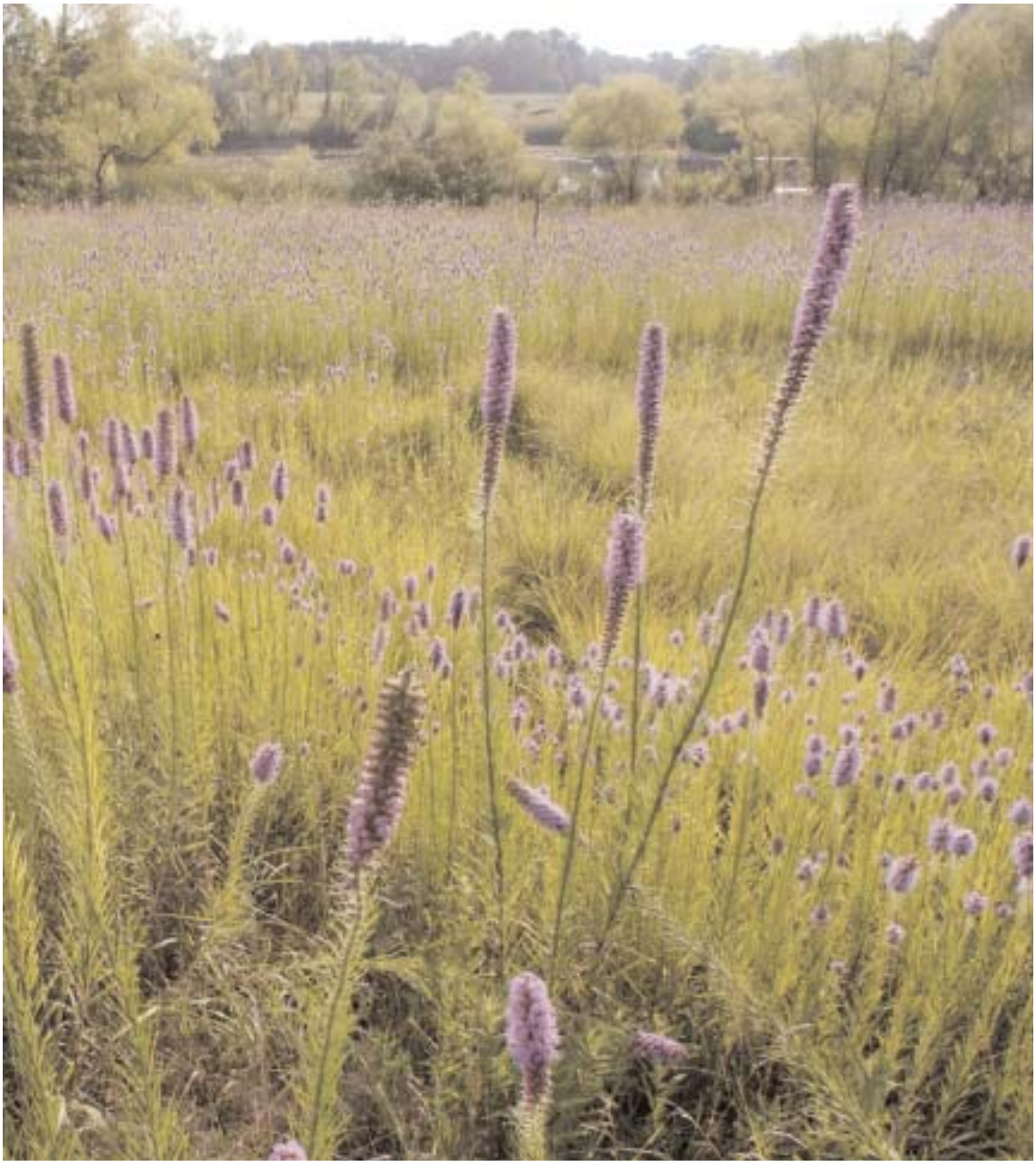

Summer 2003
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Message from the President

Dear MPF Members:

When budget times are tough, you find out who your friends are, and I am happy to report that MPF has many loyal friends. First of all, you, our members, have responded to calls for extra donations for the recent Golden Prairie acquisitions. More than $38,000 was donated in response to our first appeal letter, and the second appeal letter should have reached you about a month ago. I sincerely thank those of you who have given. Any size gift is appreciated as the total cost of the Golden Prairie expansion acreage was more than $230,000.

As we have reported in *Journal* notes and fundraising letters, the expansion of Golden Prairie from 320 acres to 620 acres is a great step forward to benefit the long-term survival of many precious prairie species, including a resident flock of prairie-chickens. Thanks to a recently completed grazing agreement with an adjacent landowner, MPF now can upgrade an additional 480 acres of prime habitat around Golden Prairie.

Another great friend to MPF has consistently been the Missouri Department of Conservation (MDC). Our expansion of the Prairie Fork Conservation Area in Callaway County received a boost this spring, when MDC awarded MPF a $40,000 grant to begin restoration of native species. Under the terms of the agreement, MPF must convert a minimum of 30 acres of row crops to a forb-rich mix of prairie species and prepare another 40 to 60 acres for future plantings. In addition, the grant provides a small amount of funding for promotion of the project throughout mid-Missouri. Our efforts to promote the project got started when reporter John Sullivan of the *Columbia Daily Tribune* covered our May 3 workday. See page 16 for more details.

Two other grants from MDC will help keep our prairies free of exotic species and will enable the spread of native plants throughout southwestern Missouri. Under the terms of a $20,000 grant agreement, MPF will hire and train a crew of workers to spray for the invasive exotic species sericea lespedeza on MPF prairies this summer. MPF will use members of a team who did similar work last summer so as much of the funding as possible will go directly to work on the ground. The other grant will fund a one-year contract for a prairie seed collection supervisor position. This new MPF employee will oversee the seed collection operation based at the Nature Conservancy's Wah'Kon-Tah Prairie near El Dorado Springs. Part-time and temporary workers from MDC will provide additional labor and TNC will provide facilities support. Through this operation, high-quality seed mixes will be harvested from public prairies for use in restoration projects of all three organizations. Aside from the grant funding, MDC employees provide MPF with countless hours of volunteer labor and expertise.

Yet another partner in our restoration efforts has been the U.S. Department of Agriculture. MPF has participated in the Wildlife Habitat Improvement Program (WHIP) and the Conservation Reserve Program (CRP) in the past, and we are hopeful that the former Bruns property near Green Ridge will be selected for inclusion in this year's CRP round, which ended on June 13. Funding decisions will be made in Washington, D.C., in August. (See page 17 for more details.)

Of course, all groups interested in Missouri's prairies have a chance to coordinate their efforts through the Grasslands Coalition, a group of public and private organizations that MPF helped organize. As I write this, MPF is getting ready to host a meeting of the Grasslands Coalition partners in Golden City to celebrate the more than $1 million that has been put to work in Missouri since the creation of the Grasslands Coalition and to make plans to attract the next million for the prairies. It takes a lot of work, but I'm sure you will all agree that doing the right thing, with the help of good friends, is always worth the effort.

Bob Elworth
President

Contents

Front cover: Henry Domke took this lovely shot of blazing star in a prairie planting at the Prairie Garden Trust near New Bloomfield. Summer is a great time to experience Missouri prairies in all their blooming glory. To explore grasslands farther afield, you can start by reading about Virginia, Mississippi and Alabama grasslands on pages 8 and 13.

The purpose and objectives of the Missouri Prairie Foundation (MPF) shall be to ensure the preservation of native prairies in Missouri along with their associated plant and animal life. The *Missouri Prairie Journal* is published quarterly by MPF. Please send your materials for the fall 2003 issue to Carol Davit, *Journal* editor, by August 31, 2003. E-mail and postal addresses are on the back cover. The editor gratefully acknowledges all individuals, agencies and groups that contribute to the *Journal*.

An Early Chapter in Grassland Development

Bob Elworth

Although the contiguous grassland biome of North America is of relatively recent origin[1], grasslands are not. The story of the origins and spread of grasslands and the coevolution of the mammals[2] that helped shape this new ecosystem is a fascinating one. Exploring this history also helps one understand the relationship between grazing animals and the prairie community.

The *Cenozoic*, the geologic era following the demise of the dinosaurs, was the age of mammals and flowering plants (Figure 1). It was the gradual drying and cooling of the world's climate along with the arrangements of the continents and their mountain ranges during the Cenozoic that set the stage for this story.

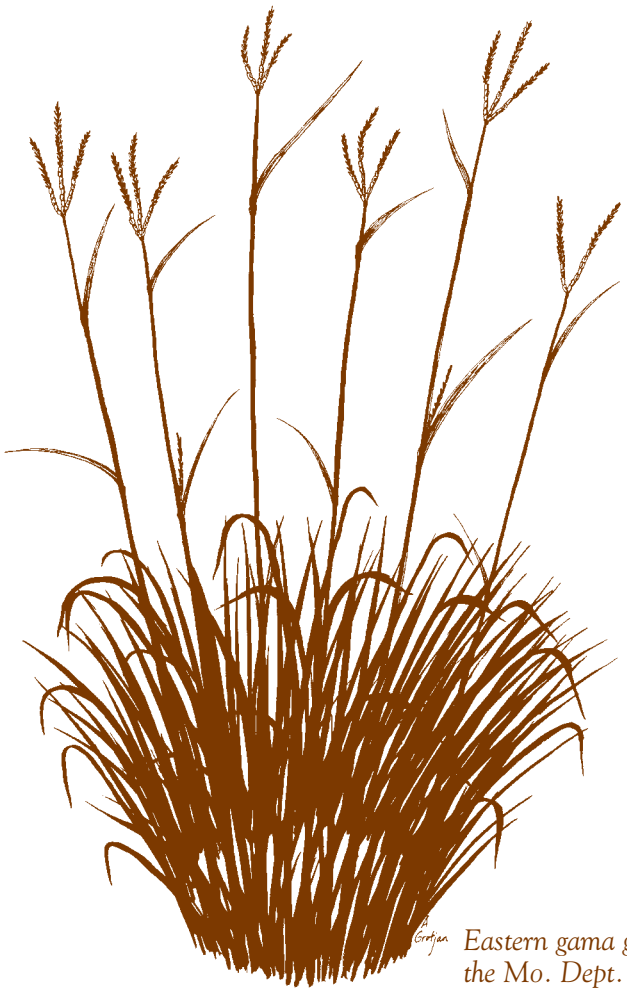
The grass family *Poaceae*, fourth largest of flowering plants in terms of species, is ecologically the most dominant and today economically the most important. The first "grasses"—woody perennials related to bamboo—occurred during the *Paleocene* (63–55 million years ago), early in the Cenozoic at the same time the first deciduous forests were appearing.

It was during the *Eocene* (55–38 million years ago) that evidence for the first modern grasses, along with widespread savanna habitat and the grazing animals that exploited them, first appeared in Patagonia, South America. North America was still tropical in climate and covered by forests. A small animal called Hyracotherium (previously Eohippus or "dawn horse"), no bigger than a housecat, browsed on leaves and fruit on the forest floor. It walked on doglike padded feet and possessed the primitive formula of mammalian teeth. But as the landscape changed so did the animals that inhabited it. The horse family is one such group.[3]

The *Oligocene* (38–24 million years ago), a transition period, brought evidence of the first grasses and savanna to North America. Evidence of cool-season grasses belonging to the tribe Stipeae (includes porcupine grass in Missouri), which probably spread from Eurasia, were well established over the central continent.

It was during the *Miocene* (24–5 million years ago) that grasslands greatly expanded. An extensive succession of recognizable grass forms was now present. In response to this open environment, mammals developed new adaptations. A premium was placed on escaping predators, and grass itself required a new type of dentition. Grasses growing in the open began embedding silica into their cell walls for structural support. Chewing grass would quickly wear out the early low-crowned mammalian tooth. Horses and other grazing animals evolved what's called the hypsodont tooth: tall, with high crowns that continually erupt through the life of the animal. The tooth surface is a complex of alternating bands of materials with different hardness: enamel, dentin and cementum that self sharpen and provide a rasplike action. The shift in diet probably reflected a relative abundance of grasses and intense competition from well established browsers.

Legs lengthened, bones fused and horses were running on the tip of the middle toe, supported by springy ligaments that flexed while running, all adaptations for speed.



Eastern gama grass; illustration courtesy of the Mo. Dept. of Conservation.

Figure 1

		Period or epoch and its length	Beginning (years ago)	Development of life on earth
Cenozoic Era	Quaternary Period	Holocene Epoch 10 thousand years	10 thousand	Human beings hunted and tamed animals; developed agriculture; learned to use metals, coal, oil, gas and other resources; and put the power of wind and rivers to work.
		Pleistocene Epoch 2 million years	2 million	Modern human beings developed. Mammoths, woolly rhinos and other animals flourished but died out near the end of the epoch.
	Tertiary Period	Pliocene Epoch 3 million years	5 million	Sea life became much like today's. Birds and many mammals became like modern kinds and spread around the world. Human-like creatures appeared.
		Miocene Epoch 19 million years	24 million	Apes appeared in Asia and Africa. Other animals included bats, monkeys, whales, primitive bears and raccoons. Flowering plants and trees resembled modern kinds.
		Oligocene Epoch 14 million years	38 million	Primitive apes appeared. Camels, cats, dogs, elephants, horses, rhinos and rodents developed. Huge rhinoceros-like animals disappeared near the end of the epoch.
		Eocene Epoch 17 million years	55 million	Birds, amphibians, small reptiles and fish were plentiful. Primitive bats, camels, cats, horses, monkeys, rhinoceroses and whales appeared.
		Paleocene Epoch 8 million years	63 million	Flowering plants became plentiful. Invertebrates, fish, amphibians, reptiles and mammals were common.

The horse family had already split into separate lines of browsers and grazers. By the late Miocene the grass family was fully differentiated and the horse family reached its apex of diversity with more than 15 species adapted to grazing in North America. Merychippus, "the horse with a new look," at 40 inches was the tallest Equine yet and had become the first of the bona fide speedy plains grazers. The family went on to spread to South America and the Old World (the only place where the true horse, Equus, survived) before disappearing altogether from North America, well before the glaciers and well before the arrival of humans.

Many of the prairie plants living today have a long evolutionary history and developed through coevolution with grazing animals. MPF members can take pride in their role in protecting remnants of what has taken millions of years to evolve.

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Bob Elworth is president of the Missouri Prairie Foundation. He lives in Willard, Missouri.

Back to the Bugs

Sharron Gough

Efforts in Missouri to stem the decline of prairie-chickens and other grassland birds have not met with much success, if annual prairie-chicken surveys are any indication. Last spring's count reflected another slight decline statewide. For populations to stabilize, recruitment must keep pace with mortality. The most critical months for prairie-chickens are April, May and June, when nests and young are vulnerable and losses to predation are highest. It is during this time in the life cycle that we have the best chance to make a difference in bird populations.

Henry Domke

Healthy populations of many insects, like this monarch butterfly larva making its way across a milkweed inflorescence, are inextricably tied to the richness and diversity of native prairie vegetation.

Adding grassland acreage, increasing structural diversity and removing trees are obvious ways to reduce predator pressure and increase nest success. These activities are on-going, though our pace is limited by time, funds and opportunity. The continued implementation of these activities, though expensive, will be necessary if they can stabilize grassland wildlife populations. Another avenue for improving recruitment is neither so expensive nor so obvious. This opportunity lies on the grounds around the nest, focusing on the chicks' requirements for insects, cover and the ability to move. Grazing can create the diverse mix of plant heights and open spaces that enhances brood mobility.

Brood mobility is important and challenging enough that it may distract us from the other half of the survival recipe—food. Anyone who has taken care of an infant knows that, though its needs are few and simple, they are immediate. A baby doesn't want to wait three minutes while the bottle heats up or the newscast is over. The baby wants it *here* and *now*. This immediacy is mirrored in the wild. Food, although generally abundant in Missouri, must be present in the correct form and in the right place and time. Within a matter of hours from hatching, and within yards of the nest, chicks need insects. Chicks have very little reserve between being alive and dead, so they must be able to acquire food readily. Cold, wet weather further taxes that reserve. That means there must be lots of food nearby of the right size in vegetative structure that allows easy access to that food with minimal expenditure of energy. Chick food is mobile. It must be chased down. Energy expended acquiring food is a net loss to a chick's reserve. Making sure that chicks have food may have a significant impact on prairie-chicken recruitment.

Biologists at the 2001 Prairie Grouse Technical Council meeting reported on lesser prairie-chicken research that links improved chick survival with greater bug mass. Insect populations were in turn related to the amount of forb growth (otherwise known as wildflowers or broad-leaved plants). Forbs attract and support a large number of insects. Areas of low forb density had four times lower chick survival. High forb density led to greater insect biomass and fewer daily movement of the hens, resulting in higher chick survival.

A prairie-chicken study at Bushwacker Conservation Area a few years ago documented a hen traveling a mile from the nest, with brood, a day after hatching. How often this occurs, or whether it commonly occurs under normal condi-

tions, is conjecture. That it occurred at all, however, makes me wonder. Research demonstrates that the greater the distance an animal travels to meet its requirements for food and cover, the greater its expenditure of energy, the greater its exposure to predators and the lower its chances of survival. Unless we subscribe to the notion that some prairie-chickens indulge in recreational travel at the expense of safety, a long move such as this one begs the question, What about insects?

Prairie grouse biologists visiting from Kansas and Illinois a couple of years ago suggested that forb populations on Wah'kon-tah Prairie were not adequate to supply needed brood-rearing habitat. Burning on all our public prairies has traditionally been done in the spring, which enhances grass vigor at the expense of spring forbs. Over the years, spring burns, while helpful for controlling brush and fescue, have probably reduced spring forbs and the insects associated with them. It's possible that the decline of some flocks may be linked to a lack of food at the critical time for broods.

In addition to forbs, it appears that fertility may be a factor affecting insect mass. A landowner near Taberville Prairie, who feeds prairie hay, observed that his cows preferred hay cut off of his farm to hay cut from Taberville Prairie. Because the two prairies are side by side on the same soil types, he surmised that the cows' preference to his hay was because it was "sweeter" due to the occasional dose of lime, phosphorous and potassium that his prairie received, which the public prairie did not.

To test the fertility hypothesis, we conducted informal research on Osage Prairie, treating plots with lime only, and with lime, phosphorous and potassium, to see whether and how the treatments would affect insects. Two sets of treatments were done, one on an area that appeared to be good prairie-chicken habitat, with lots of forb diversity, and one that was too overgrown with blackberry brush to qualify as good habitat. Insects were collected in the first week of June, at the peak of the prairie-chicken hatch. On the good chicken habitat, the unfertilized area yielded roughly 100 insects; roughly 200 insects were collected from the lime-only treatment; and more than 300 insects were removed from the nets of the lime, phosphorous and potassium treatments. It appears that insects are at least as adept as cows in detecting nutrient differences in forages.

Henry Domke

Soldier beetles (Chauliognathus pennsylvanicus) *on a prairie.*

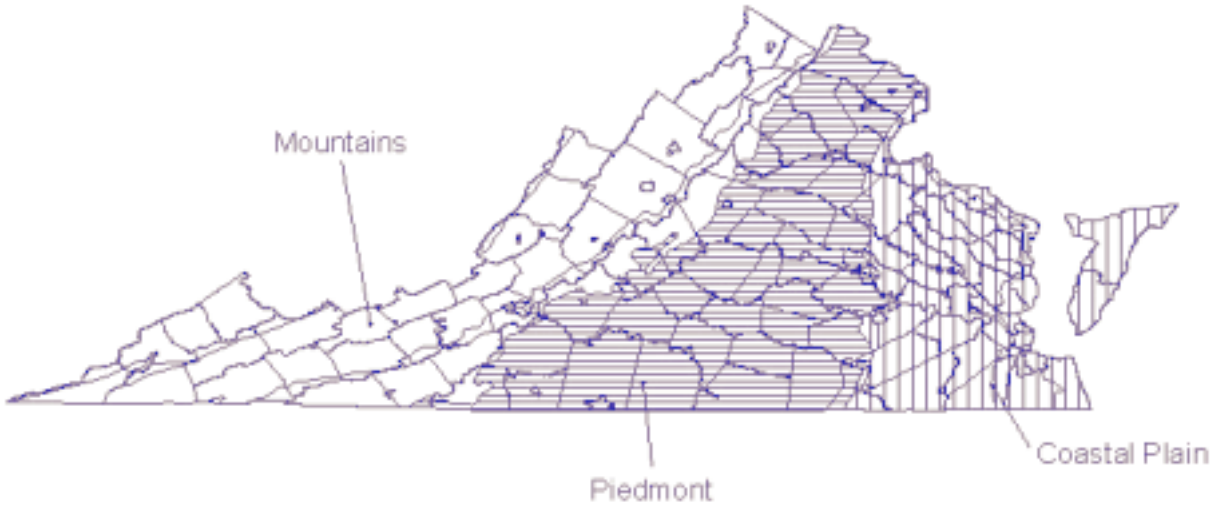
Our prairies have been hayed on a regular basis for more than 100 years. Since acquisition by the state, soil amendments have not been made on public prairies for fear they might negatively impact relationships of soil biota and plants that are poorly understood at best. Perhaps our desire to "do no harm" should be reexamined, at least on portions of our prairies. According to University of Missouri Soil Fertility Specialist Peter Scharf, an average ton of prairie hay removes 10 pounds of phosphate (P205) and 35 pounds of potassium (K20) from the soil. That adds up to a significant nutrient drain over the years, even for the deep-rooted prairie forbs and grasses. It's possible that prairie insect populations are depressed because of a lack of nutrition brought on by low soil fertility.

Our understanding of prairie is steadily evolving, and with it, our management techniques. Twenty-five years ago, recognizing the importance of fire, managers struggled to gain its acceptance as a management tool. Spring burns were favored because of their comparative ease and safety, and impact on invading trees and fescue. However, research has demonstrated that burning in other seasons results in a greater increase in plant and animal diversity. Increasingly, prairie managers are using summer, fall and winter fires to favor forbs and insects. Likewise, traditional rest, hay and fire rotations on public prairies helped retard tree and brush encroachment, but did not provide the mix of diverse vegetation heights and bare ground that are important for chick mobility. These regimes are gradually being modified with the addition of patch-burning and grazing and effects on plants and animals. Research on grazing and insect availability will continue on Taberville next summer.

Sharron Gough is prairie-chicken specialist with the Missouri Department of Conservation and a technical advisor for MPF. Sharron's article was published first in the Native Warm-Season Grass Newsletter, *Vol. 22, No. 1, and is reprinted here with permission.*

Prairies of the Old Dominion

Michael J. Leahy



Prairies in Virginia? Well not exactly, but there are a number of prairie-like natural communities in the state and elements of a relict prairie flora. The small areas of prairie vegetation in Virginia add to the overall biological diversity of the state in much the same way that the small areas of beech-maple cove forests found in the Cape Girardeau area of Missouri add to the biological diversity of the Show-Me state. Beech-maple forests are at the western edge of their range in Missouri just as prairie vegetation is at its far eastern edge of range in Virginia. As a transplanted midwesterner, MPF member and new in my job as a regional natural areas steward for the Virginia Division of Natural Heritage, I am interested in the prairie plants that grow here in this state. Some of the natural area preserves that I help manage contain distinct elements of a prairie flora.

Physical Geography of Virginia

Interestingly, Virginia is located in about the same latitudinal belt as Missouri. Like in Missouri, Virginia's climate varies across the state. On average, Virginia receives 45 to 46 inches of rain per year, which can vary from as low as 34 inches in the Shenandoah Valley to as high as 50 inches in the far southwestern corner of the state (Woodward and Hoffman 1991). On average, the distribution of precipitation is more even throughout the year in Virginia and is less continental than in Missouri (Nigh and Schroeder 2002), i.e., less marked by extremes. From west to east, Virginia has three major natural divisions: the Appalachian Mountains, the Piedmont ("the foothills of the mountains") and the Coastal Plain. Elevations range from sea level to 5,729 feet. Soils are predominantly forest-based soils that are often leached and brown to reddish in color. Unlike in Missouri, no areas in Virginia have deep, rich and nearly black prairie soils (Mollisols). Virginia is decidedly in the eastern deciduous forest biome (Bailey 1995) and the tendency here is to grow trees. However, particular combinations of soil and hydrologic conditions by themselves or in combination with disturbances such as fire or grazing have created small native grasslands across the otherwise forested landscape of Virginia.

Paleoecology of Virginia

Virginia was never glaciated but the continent's glaciers had a distinct influence on the vegetation of the state. Around 18,000 years ago, the vegetation of Virginia was a spruce-fir forest (Watts 1980, Delcourt and Delcourt 1993). Like Missouri, Virginia's climate was influenced by the "Hypsithermal period" from 8,700 to 5,000 years ago in which the climate of the eastern U.S. became hotter and drier. It was during this period that oaks and pines became widespread across Virginia, and at the same time, elements of the state's prairie flora were established here. During this same time period in the Midwest, the "prairie peninsula" was formed with tallgrass prairies stretching from Kansas to as far east as Ohio. From 4,000 to 500 years ago, American Indians utilized fire and agriculture that had a distinct influence on the vegetation of

Virginia, likely maintaining the state's prairie flora even as the climate became more cool and wet after the Hypsithermal. European American settlement of Virginia came much earlier than in Missouri, with the Coastal Plain settled in the early 1700s, the Piedmont settled in the mid-1700s and larger valleys in the Appalachian Mountains settled by 1800 (Woodward and Hoffman 1991). Also of note, both American bison (*Bison bison*) and elk (*Cervus elaphus*) occurred in the presettlement landscape of Virginia's mountains and Piedmont.

Prairie Flora

Virginia has approximately 2,564 native plant species (Missouri has about 2,064; Kartesz 1994), of which about 18% can be considered midwestern tallgrass prairie plants (Ladd 1997) in the very broad sense, i.e., many of these are native plants of old fields, marshes, glades and other prairie-like communities. Many common tallgrass prairie plants that are widespread in Virginia include the "big four" native grasses: big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), little bluestem (*Schizachyrium scoparium*), and switchgrass (*Panicum virgatum*). Other not uncommon prairie plants in Virginia include scaly blazing star (*Liatris squarrosa*), New England aster (*Aster novae-angliae*), flax-leaved aster (*Aster linariifolius*), pasture rose (*Rosa carolina*), prairie phlox (*Phlox pilosa*), goat's rue (*Tephrosia virginiana*), obedient plant (*Physostegia virginiana*), butterfly milkweed (*Asclepias tuberosa*), hoary puccoon (*Lithospermum canescens*), wood betony (*Pedicularis canadensis*), yellow star grass (*Hypoxis hirsuta*), golden Alexanders (*Zizea aurea*), old-field goldenrod (*Solidago nemoralis*), showy goldenrod (*Solidago speciosa*), false toadflax (*Comandra umbellata*), flowering spurge (*Euphorbia corollata*), wild quinine (*Parthenium integrifolium*), New Jersey tea (*Ceanothus americanus*) and slender mountain mint (*Pycnanthemum tenuifolium*).

Many Missouri prairie birds are at their extreme eastern range in Virginia, such as the Henslow's sparrow, above, which is listed as rare in Virginia. Rattlesnake master, below left, is common on Missouri prairies but listed as rare in Virginia. Illustrations courtesy of the Missouri Department of Conservation and the Illinois Dept. of Natural Resources, respectively.

Most tallgrass prairie plants are at the very eastern edge of their range in Virginia. As the old field biology adage goes, "everything is rare somewhere," and prairie species are no exception. Many prairie plants common in Missouri are state-listed as rare in Virginia. Some of these species include rattlesnake master (*Eryngium yuccifolium*), freshwater cordgrass or ripgut (*Spartina pectinata*), rigid goldenrod (*Solidago rigida*), winged loosestrife (*Lythrum alatum*), sessile-leaved tick trefoil (*Desmodium sessilifolium*), and narrow-leaved loosestrife (*Lysimachia quadriflora*). Surprisingly Virginia has only one native coneflower species, smooth coneflower (*Echinacea laevigata*), which is globally rare and federally endangered, occurring only in scattered locations in the Carolinas, Virginia and Georgia. It is thought that the Ozarks may have been a center of *Echinacea* evolution and that smooth coneflower may have recently speciated from purple coneflower (*Echinacea purpurea*).

Many conservative prairie species don't even occur in Virginia, including leadplant (*Amorpha canescens*), compass plant (*Silphium laciniatum*), purple and white prairie clovers (*Dalea purpurea*, *D. candida*), sky blue aster (*Aster oolentangiensis*), pale purple coneflower (*Echinacea pallida*), prairie core-

Va. Division of Natural Heritage file photo

Va. Division of Natural Heritage file photo

Clumps of marsh marigold, skunk cabbage, queen-of-the-prairie (at far left) and other prairie fen plants grow at Cowbane Prairie Natural Area Preserve, at near left.

opsis (*Coreopsis palmata*), prairie blazing star (*Liatris pycnostachya*), and downy gentian (*Gentiana puberulenta*).

Prairie-like Natural Communities

Going from west to east, native grasslands occur in all three of the major natural divisions of Virginia. On mountain slopes, barrens natural communities harbor elements of a prairie flora while in the larger valley of Virginia between the Blue Ridge and the Allegheny Mountains, a few remnants of bottomland prairie/fen complexes occur. In the Piedmont, small remnants of prairie openings occur in areas once harboring extensive woodlands and savannas. Along the Coastal Plain, dune systems and saltwater marshes contain native grasslands with less of a prairie flora but still have a prairie appearance.

The most prairie-like of Virginia's natural communities are actually called prairies (although technically they really are not true tallgrass prairies with prairie soils) in the natural community classification of the state (Fleming et al. 2001) and include two groups: mesic/wet-mesic prairies and wet prairies/prairie fens. Both of these groups of natural communities occur on floodplain landforms in the "Great Valley" region of Virginia. Here the Shenandoah River system forms a broad valley that lies between the Allegheny Mountains to the west and the Blue Ridge Mountains to the east. This area lies in a rain shadow of the high Allegheny Mountains along the Virginia/West Virginia state line and receives as little as 34 inches of annual precipitation.

Kercheval's (1902) history of the Great Valley contains some interesting descriptions of this area, indicating the presence of native grasslands in the region during the colonial era:

About the year 1763, the first settlements were made at or near the head of Bullskin . . . At this period timber was so scarce that the settlers were compelled to cut saplings to enclose their fields. The prairie produces grasses five to six feet high, and even our mountains and hills were covered with the sustenance of quadrapeds of every species.

Much the greater part of the country between what is called the Little North Mountain and the Shenandoah River, at the first settlement of the Valley was once vast prairie, and like the rich prairies of the west, afforded the finest possible pasturage for wild animals. The country abounded in the larger kinds of game. The buffalo, elk, deer, bear, panther, wild-cat, wolf, fox, beaver, otter . . .

Great Valley Native Grasslands

These native grasslands of the large valleys of the Virginia Appalachians comprise three groups of natural communities:

Mesic/wet-mesic prairies: These grasslands occur on moderately well-drained to somewhat poorly drained floodplain terraces. The vegetation is dominated by big bluestem and Indian grass. Associated species with prairie affinities include willow aster (*Aster praealtus* var. *angustior*), rattlesnake master, and Culver's root (*Veronicastrum virginicum*). It is conjectured that in the precolonial era, American Indian fires, agricultural cultivation, flooding and bison and elk grazing may have maintained these grasslands. The extremely few remnants of this natural community today have been maintained by livestock grazing and haying.

Wet prairies/prairie fens: These herbaceous wetlands occur on large stream or river floodplain terraces constantly saturated by perched groundwater or seepage from adjacent slopes. These very rare communities are limited in Virginia to a few sites (Fleming et al. 2001). The vegetation is graminoid-

dominated with sedges (*Carex* spp.), rushes (*Juncus* spp.), freshwater cordgrass, sweet grass (*Hierochloe odorata* ssp. *odorata*) and switchgrass. Many state-rare or uncommon forbs are also components, including queen-of-the-prairie (*Filipendula rubra*), smooth loosestrife, spotted joe-pye-weed (*Eupatorium maculatum*), winged loosestrife, hooded skullcap (*Scutellaria galericulata*) blueflag iris (*Iris versicolor*), marsh marigold (*Caltha palustris*) and vetchling (*Lathyrus palustris*).

Va. Division of Natural Heritage file photo

Prescribed fire is one tool used to restore native grasslands in Virginia, such as here at Cowbane Prairie Natural Area Preserve. Note the Blue Ridge Mountains in the background.

Riverside prairies: These are areas of native grassland vegetation on stabilized gravel bars along major rivers in the Great Valley (and the Piedmont), particularly the James and Potomac Rivers. These areas receive flood scour and typically are droughty by late summer due to shallow, gravelly soils. The vegetation is a mix of big bluestem, freshwater cordgrass, switch grass, willows (*Salix* spp.) and forbs. Blue wild indigo (*Baptisia australis* var. *australis*), obedient plant, whorled rosinweed (*Silphium trifoliatum*) and clasping-leaved dogbane (*Apocynum sibiricum*) are characteristic forbs (Fleming et al. 2001).

Mountain Grasslands

Limestone and dolomite barrens: In the Ridge and Valley section of Virginia's Appalachian Mountains, areas of exposed limestone and dolomite on steep southwest-facing slopes form barrens or glade natural communities that look similar to the limestone and dolomite glades of Missouri. These areas are refugia in Virginia for many prairie plants. Warm-season prairie grasses, including big bluestem, little bluestem, Indian grass, side-oats grama (*Bouteloua curtipendula* var. *curtipendula*), and rough dropseed (*Sporobolus clandestinus*) characterize the largely herbaceous vegetation of the barrens (Fleming et al. 2001). Prairie-associated forbs include eastern indian paintbrush (*Castilleja coccinea*), obedient plant, tall gay feather (*Liatris aspera* var. *intermedia*) and rigid goldenrod (*Solidago rigida*).

Piedmont Prairies

On the rolling hills of the Virginia Piedmont occur some very small remnants of Piedmont "prairies" and woodlands (Fleming et al. 2001). These natural communities often occur on metamorphosed igneous rock high in magnesium and other cations (mafic rocks), which also often contain shrink-swell clays that create hardpan-type conditions. Because of the long history of fire suppression in Virginia, the best current examples of Piedmont prairies occur on military bases in training areas subjected to frequent incendiary fires over the last 50 years and in scattered power line rights-of-way as the result of long-term periodic mowing. The vegetation of most Piedmont prairies is dominated by little bluestem and Indian grass. Prairie forbs include bushy aster (*Aster dumosus*), tick-trefoils (*Desmodium* spp.), bushclovers (*Lespedeza* spp.), scaly blazing-star (*Liatris squarrosa*), narrow-leaved mountain mint, orange coneflower (*Rudbeckia fulgida*), few-flowered nutrush (*Scleria pauciflora*), and goldenrods (*Solidago nemoralis* and *S. juncea*). A number of state-rare, light-demanding species, e.g., rigid goldenrod and blue-hearts (*Buchnera americana*), are associated with these communities. Piedmont hardpan woodlands associated with the Piedmont prairies are dominated by eastern needlegrass (*Stipa avenacea*), which looks very similar to the porcupine grass (*Stipa spartea*) of Missouri prairies.

Coastal Grasslands

Along Virginia's Atlantic Ocean and Chesapeake Bay coasts occur two different types of natural communities that are native grasslands of a sort (Fleming et al. 2001):

Maritime dune grasslands: These grasslands occur on sand dunes buffeted by wind and periodic storm surges. They are dominated by saltmeadow cordgrass (*Spartina patens*), American beachgrass (*Ammophila breviligulata*), sea oats (*Uniola*

paniculata), beach panic grass (*Panicum amarulum*) and seaside little bluestem (*Schizachyrium scoparium* ssp. *littorale*).

Tidal salt marshes: These wetland grasslands occur in brackish zones along tidal rivers, estuaries and flat plains along the ocean shore. Grasses such as big cordgrass (*Spartina cynosuroides*), switchgrass, saltmarsh cordgrass (*Spartina alternifolia*), salt-meadow cordgrass (*Spartina patens*) and saltgrass (*Distichlis spicata*) dominate depending on salinity levels and grow in mixtures with rushes, bulrushes (*Schoenoplectus* spp.), smartweeds (*Polygonum* spp.), sedges and other marsh plants.

Conservation of Virginia's Native Grasslands

A number of agencies and private conservation organizations are working to conserve and restore the native grasslands of Virginia. In the Great Valley of the mountain region, the Virginia Division of Natural Heritage and the Nature Conservancy own Cowbane Prairie/South River preserves with bottomland prairies/fens. Currently, prescribed fire and chemical and mechanical thinning are being used to reduce woody cover and combat invasive, exotic species at this site. The Virginia Division of Natural Heritage and the Nature Conservancy have established four preserves that protect limestone and dolomite barrens in the western mountains of Virginia. Currently, thinning and prescribed fire are being investigated as management tools at these sites. The Jefferson National Forest protects a number of other calcareous barrens. Riverside prairies are currently protected at fewer than 10 sites owned by the U.S. Forest Service, the National Park Service and the Virginia Division of Natural Heritage. In the Piedmont, the Virginia Division of Natural Heritage and the Nature Conservancy have established two preserves to restore Piedmont prairies and woodlands. Prescribed fire and thinning have been initiated at both sites. In addition, the Virginia Division of Natural Heritage has worked with military bases in the Piedmont on an inventory of Piedmont prairie vegetation occurring on these lands. Along the coast, a number of groups—from the U.S. Fish and Wildlife Service to local municipalities—have helped conserve tidal salt marshes and dune grasslands. Current coastal grassland efforts are focused on controlling the invasive species giant reed (*Phragmites australis*) and protecting existing coastal areas from development pressures.

Those interested in visiting Virginia's prairie-like communities are welcome to contact me at mleahy@dcr.state.va.us for more information.

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Dixieland Prairies and Glades

James C. Trager, Ph.D.

From June 2 through 7, 2003, I was invited by the Entomology Museum of Mississippi State University to accompany my entomologist colleagues in their studies on the blackland prairies of Mississippi and the glades of Bibb County, Alabama. The entomology was fun, of course, but I couldn't help but botanize, as well.

The blackland prairie occurs in a large crescentic area stretching from north central Mississippi to west central Alabama, in a disjunct patch in east-central Arkansas, and in smaller patches in Texas, Oklahoma, Louisiana and Georgia.

During the drier, cooler climes of the last glaciation, prairie apparently occupied at least these parts of the greater Gulf Coast region, and perhaps expanded beyond them. In the prehuman era, these grasslands supported a rich fauna of large mammals, including mammoths, several species of horses, and some formidable predators. As the glacier retreated, and humans arrived with their fire-hunting practices, the mammals didn't fare well, but these southern refugia served as sources for colonization of the northern parts of today's tallgrass prairie region by much of its characteristic plant and insect life. In addition to the long list of plant species in common, detailed studies of moths, beetles and other groups demonstrate strong connections between the insect fauna of the eastern Great Plains and that of the blackland prairies.

James Trager

The lovely pink Spigelia gentianoides *var.* alabamensis *grows on glades in Bibb County, Alabama.*

The blackland prairie remnants of today are few, since all the deeper soil parts were converted, first to cotton agriculture, and now to growing soybeans. The existing remnants are the most xeric, shallow-soil patches, i.e., those not suitable for plowing. They overlie deep cretaceous chalk deposits, which are exposed in eroded areas as grayish "moonscapes." The first European settlers to the area noted these chalky gullies as natural features of the blackland prairies, but today they often serve as convenient (illegal) roadside dumps. The grassy areas between them have gone unmanaged for decades and now sport healthy populations of *Juniperus virginiana* (eastern red cedar). Another, somewhat surprising woody invader is *Berchemia scandens* (supple-jack vine). The conservation communities of the southern states are only just beginning to actively protect and manage their prairie sites, thus far with almost no governmental assistance.

With such shallow soil overlying a low-nutrient, calcareous substrate, one might imagine the herbaceous vegetation would resemble an Ozark glade or calcareous prairie, and indeed, this is the closest analogy among familiar vegetation here in Missouri. *Schizachyrium scoparium* (little bluestem), *Fimbristylis puberula* (in the sedge family) and *Dalea purpurea* and *D. candida* (purple and white prairie clover) are dominants, occurring along with familiar *Liatris*, *Silphium*, *Coreopsis* and *Arnoglossum* species. An interesting feature in these alkaline sites is the occurrence of several organisms characteristic of more acidic sites in the Ozarks, e.g., *Liatris squarrosa* (scaly blazing star) and the ant *Paratrechina arenivaga*, the latter strictly a sand inhabitant in Missouri. Strangely absent from the blackland prairie remnants I visited was any hint of *Echinacea*, but I was told that *E. purpurea* (and several plants more typical of mesic prairies) occur in abundance at a site I was unable to visit called Chickasaw Prairie.

The Bibb County, Alabama, glades occur in a geologically complex environment of the Cahaba River drainage, which reminded me a bit of our Big River in appearance and flow rate. The river has

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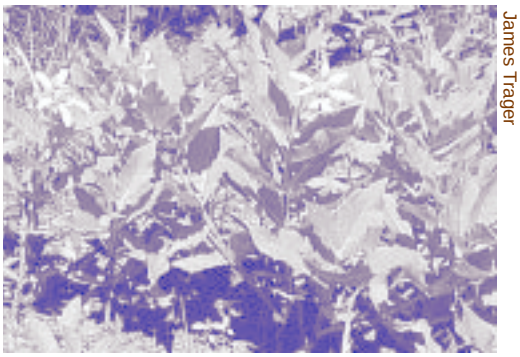


The photo above is one of the Bibb County glades, which support, among other interesting plants, Tetragonothecea helianthoides *(squarehead sunflower), lower right.*

sandy, mostly gently sloping banks supporting an open riparian forest, and is shallow and flat-bottomed in its course, supporting thriving populations of *Justicia americana* (water willow) and *Hymenocallis caroliniana* (spider lily). The uplands surrounding the glades are steeper than the riparian area. On the high ground and ridges, pine-bracken savannas with many interesting legumes and composites occur on the sandstone-based soils, while dense oak-pine-hickory forest occurs on the loamy, lower slopes.

The glades themselves occur on rough outcrops of chemically very pure dolomite (no silicates) and look rather unlike glades I'm familiar with here in Missouri. Woody invaders include the expected *Juniperus virginiana* (eastern red cedar), plus the quite unexpected *Pinus palustris* (longleaf pine). The herbaceous dominants are *Schizachyrium scoparium* (little bluestem), and *Amsonia ciliata* (blue star), nearly half and half! There is a strong representation of an endemic, perennial variety of *Erigeron strigosus*. *Echinacea* and *Oenothera* species, so characteristic of Missouri glades this time of year, were totally lacking, but other beauties were present, such as two *Onosmodium* (gromwell) species, the extraordinary pink *Spigelia gentianoides* var. *alabamensis*, purple-flowered *Dalea cahaba*, several rosinweed-like *Silphium* species, and in drainages, sedges of the largely tropical sedge group *Dichromena* (now considered to belong in *Rhynchospora*). All tolled, there are six endemic species or varieties of flowering plants on these glades.

The Nature Conservancy (TNC) of Alabama has recently acquired and begun a management program involving prescribed burning at the Bibb County glades site I visited. I hope to return in a few years and see the progress in the recovery of the vegetation. Another hope is that TNC will be able to address the significant invasion of the glade sites by fire ants, to the exclusion of native species. Native ants still dominate most of the surrounding areas, but fire ants have made themselves the "kings of their hills" in the glades.

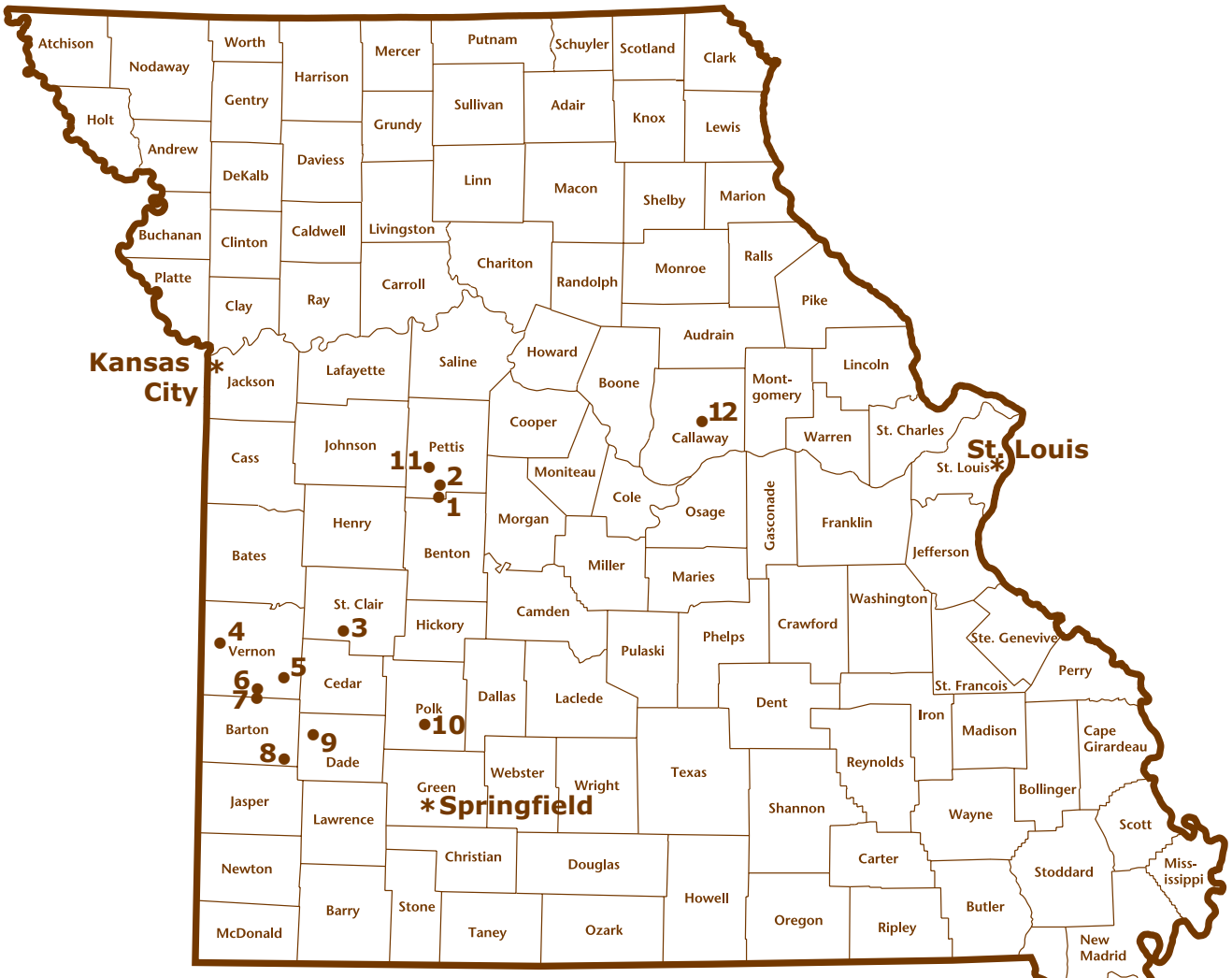
For more information, peruse the many Internet resource on southern prairies and glades: There are many, but for starters, see the following:

Blackland prairies:
http://www.dasnr.okstate.edu/s257/south/mlra/135.htm

Flora of Bibb County glades: http://www.epa.gov/grtlakes/oak/Proceedings/Allison.html

Dr. James Trager is the restoration biologist at Shaw Nature Reserve in Gray Summit, Mo. James is also an entomologist specializing in ants. James' article also appears in the current Petal Pusher *newsletter of the Missouri Native Plant Society.*

Visit an MPF Prairie this Summer!



1 Drovers Prairie
2 Friendly Prairie
3 Schwartz Prairie
4 Stilwell Prairie
5 Gay Feather Prairie
6 Lattner Prairie
7 Edgar & Ruth Denison Prairie
8 Golden Prairie
9 Penn-Sylvania Prairie
10 LaPetite Gemme Prairie
11 Bruns Tract
12 Prairie Fork Expansion

For directions to any MPF prairie, contact the MPF office at 1-888-843-6739. For detailed information on any of the MPF prairies, visit www.moprairie.org.

Mid-Missouri Prairie Day Draws Attention to MPF

More than two dozen volunteers turned out on the morning of May 3 to help clear brush along the fence line at Tucker Prairie. The 146-acre site is owned by the University of Missouri and visible from I-70 between Columbia and Kingdom City. Current board member and University of Missouri professor John Faaborg manages the area. Emeritus board member Clair Kucera was among those in attendance. Dr. Kucera originally helped save the area with a grant from the National Science Foundation. As many as 224 plant species have been recorded at Tucker Prairie. MPF is proud to assist MU's efforts to protect one of the last examples of native prairie in mid-Missouri.

Later that day, volunteers continued to work at MPF's Prairie Fork expansion project. The weather was perfect, which had a negative effect on volunteer turnout. Those who attended, however, were able to accomplish plenty. A team of volunteers removed about one-fifth of a mile of five-strand barbed wire fence, and three chainsaws were active along the fence line. After three work days in the last year, MPF members have cleared and removed nearly the entire fence that separates the MPF property from the more than 800 acres owned by the Missouri Department of Conservation, immediately to the south. The highlight of the day was a visit from *Columbia Daily Tribune* reporter John Sullivan. An article appeared on the back page of the news section on Sunday, May 4, and included a color photo of board member Bruce Schuette cutting trees along the fence. The article can be viewed online at http://archive.columbiatribune.com/2003/may/20030504news005.asp.

At the end of the day, some MPF members visited the Prairie Garden Trust near New Bloomfield and enjoyed a potluck supper (see photo at left).

Stilwell Prairie Volunteers Enjoy Work and Play

The annual spring campout and workday at Stilwell Prairie brought out a nice crowd for work, food and fun. Prairie Operations Manager Richard Datema and MPF Vice President Wayne Morton led the work crew, which included four volunteer chainsaw and stump treatment teams. Brenda Priesendorf from the Natural Resources Conservation Service in Benton County stopped by to help MPF fill out paperwork for the Wildlife Habitat Improvement Program (WHIP) and stayed to help treat stumps for two hours. Board member Stan Parrish and MPF member Don Kollmeyer led the dutch oven campfire cooking team, which produced a Mexican dinner and several fruit cobblers for more than 40 hungry guests. George Parsons provided guests with a fun way to view the prairie, from his wagon drawn by miniature draft horses. Everyone had fun, especially the youth, who spent the day running and playing without a video game or DVD in sight. The next campout and workday at Stilwell is scheduled for Saturday, October 18.

State Wildlife Grants Help MPF Continue Progress

The Missouri Department of Conservation has awarded three separate grants to MPF through its State Wildlife Grant (SWG) program. A grant of $40,000 will help begin restoration of native grasses and forbs at the Prairie Fork expansion area. A $20,000 grant will allow MPF to control the spread of sericea lespedeza, an aggressive exotic plant, on our properties. Finally, a grant of more than $23,000 will hire a full-time MPF employee who will help prairie seed collection efforts in southwestern Missouri.

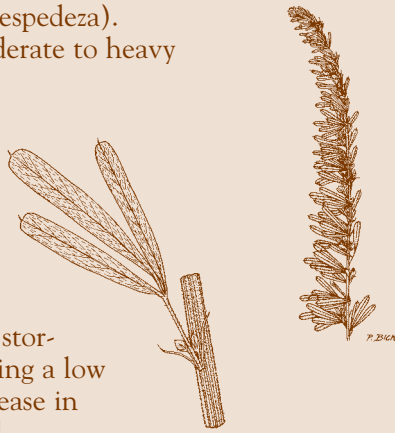
Further Adventures of a Sericea Slayer

Sericea lespedeza will likely be a problem exotic plant in tallgrass prairies for a long time and better methods of control are urgently needed. The following is an account of my observations of a *decrease* in sericea on a planted tallgrass prairie in east-central Missouri (see the spring 2002 issue of the *Journal* for additional information on sericea lespedeza).

In early June this year I inspected a portion of this prairie that had moderate to heavy infestation of sericea in 2002, but I could find very little this year. In 2002 this area was mowed with a brush-hog on August 22. The sericea was mixed with a good stand of big bluestem and Indian grass. The mowed area was then burned 22 days later on September 13. Sufficient fuel and warm, dry conditions produced a clean burn.

Although this was not a well controlled experiment and the area mowed and burned was only about 0.5 acre, the results are encouraging.

An examination of the physiology of sericea sheds light on why mowing and summer burning may be a good method of control. Carbohydrate storage in the root/crown region decreases dramatically in late summer, reaching a low point at the flower bud stage. With the onset of flowering there is an increase in storage. Also at this late stage of the growing season, new buds are formed on the crown of the plant.



Sericea lespedeza; illustration courtesy of the Mo. Dept. of Conservation.

When sericea is mowed at the flower bud stage it is vulnerable since its root reserves are at a low point. A burn several weeks later hits the sericea with a double whammy. A good fire may produce enough heat close to the ground to kill the sericea regrowth and the new buds on the plant crown.

Of course an effective burn would require having enough dry mown grass on the ground to carry the burn and produce enough heat.

I will be using this mow/burn method of control on this prairie wherever there are large areas of sericea infestation and monitoring its effectiveness in coming years. I'll report back the results, and I would be interested in hearing from readers who may have tried this same technique. I can be reached at my contact information on the back page of this *Journal*.

—Bill Davit, MPF board member and ruthless sericea slayer

Golden Prairie Grant Decision Delayed

The National Fish and Wildlife Foundation (NFWF) has informed MPF that the grant proposal for Golden Prairie was not acted upon by its board of directors during the March meeting. The project has been postponed by NFWF, along with many others, due to a delay in receipt of federal funding. MPF believes that the grant, proposed for $75,000 to restore newly acquired property near Golden Prairie, will be recommended for funding at NFWF's summer board meeting in late July. The NFWF is a nonprofit organization created by Congress to build resource conservation partnerships through matching grants to local government and nonprofit organizations. Grants from NFWF have been instrumental in recent prairie protection efforts of MPF, the Missouri Department of Conservation, the Nature Conservancy and other Grasslands Coalition partners.

CRP Possibility

MPF has offered 116 acres of its land outside Green Ridge, often referred to as our Bruns property, for enrollment in the Conservation Reserve Program (CRP). If accepted, the Farm Service Agency (FSA) would assist MPF in the establishment of native grasses and forbs on the property, which is currently farmed. Under the terms of the program, FSA would then pay MPF an annual rental fee to offset the costs of lost farm income and to help MPF maintain the native planting. CRP has helped convert millions of acres of American farmland to permanent cover to reduce erosion, improve water quality and provide wildlife habitat. The current CRP program will enroll 2.8 million acres nationwide.

MPF joins USDA State Technical Committee

MPF's Development Manager Justin Johnson has joined the U.S. Department of Agriculture's State Technical Committee for Missouri. The committee meets several times a year in Columbia to discuss implementation of programs administered by the Natural Resources Conservation Service and Farm Service Agency. Farming, ranching and wildlife interests are represented on the committee.

Calendar of MPF and other Prairie-related Events

July 12: Bison Hike at Prairie State Park, 9:00 a.m. Discover bison and their prairie habitat on this free naturalist-led hike. To sign up for the hike, call 417-843-6711.

July 25: A Night on the Prairie at Prairie State Park, 9:00 p.m. Experience prairie life at night by using all your senses. To sign up for the hike, call 417-843-6711.

August 2: Wildflower Hike at Prairie State Park, 10:00 a.m. Discover the diversity of summer prairie wildflowers. To sign up for the hike, call 417-843-6711.

August 2: Nature at Night—Junior Naturalist "Night" Camp at Prairie State Park: 2:00 p.m. to 10:00 p.m. Children of all ages, earn your Junior Naturalist patch while exploring the day and night life of the prairie through hiking, hands-on activities, games and crafts. Preregistration is required; call 417-843-6711.

September 6: Wildflower Hike at Prairie State Park, 10:00 a.m. Experience the tall grasses at their maximum height along with a variety of autumn wildflowers. To sign up for the hike, call 417-843-6711.

Other planned programs coming to Prairie State Park this summer and fall are Prairie Mammals, Insect Fashion Show—Survive in Style, Discover the Prairie through Little House on the Prairie Books, and more Bison Hikes. Please contact the park for dates and times at dspprair@mail.dnr.state.mo.us or 417-843-6711.

September 12–14: Shaw Nature Reserve Native Plant Conference. Sponsored by Shaw Nature Reserve of the Missouri Botanical Garden and Wild Ones Natural Landscapers, this year's conference features great speakers and an expanded offering of workshops and tours. In addition, the Wild Ones National Annual Meeting will be held during the conference on Saturday; everyone is welcome to attend. Conference speakers include Mike Sands, chief ecologist at Prairie Crossings, a successful housing development in the Chicago area that promotes green space preservation and home landscaping with prairie and savanna plants; Bret Rappaport, past president of Wild Ones and a Chicago attorney who has written and lectured on weed laws and successful native landscapes in urban places; and Larry Lowman, owner of Ridgecrest Nursery in Arkansas, who has selected and introduced cultivars of several native plants into the horticulture industry.

In addition, talks, tours and field trips will explore stormwater management, energy-saving home landscaping, wild edibles and native medicinals, and large-scale prairie landscaping. Registration is $55 ($35 for students) and lodging in historic log cabins is available for $35 per night. Call Shaw Nature Reserve at 636-451-3512 to register and for more information.

October 18: Family Campout/Prairie Day at Stilwell Prairie. Meet other MPF members at MPF's Stilwell Prairie in Vernon County for a free Saturday night supper and camping on the prairie. Enjoy guided walks on the prairie, activities for children, pond fishing, acoustic music, free supper (registration required), campfire songs, campfire desserts (roasted marshmallows and s'mores) and remote camping on the prairie. Optional activities: adults and older children can help with prairie management. Please bring brush-clearing tools and safety equipment. To register, for directions and for more details, contact Arthur Benson at 816-531-6565 or abenson@BensonLaw.com.

October 31 and November 1: 2003 Prairie Invertebrate Conference. This annual conference, cosponsored by Riveredge Nature Center of Newburg, Wisconsin, Shaw Nature Reserve of Gray Summit, Missouri, and the Missouri Department of Conservation, will be held at Shaw Nature Reserve. Proposals for 20-minute talks or possible workshops dealing with prairie insects or other invertebrates should be submitted to Dr. James C. Trager at Shaw Nature Reserve, preferably as a text or Word attachment, at james.trager@mobot.org.

An Appreciative Welcome . . .

. . . to new members and to former members who have rejoined from March 1 through June 12, 2003.

Eva Allen
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George Arfstrom
Paul E. Arnold
Ruth Ayers
Kenneth Balk
Richard Bucholz
Willard B. Bunch
Jim Busch
Jane Byland
Bill Caldwell
Robin Carnahan
Chrissie Cooper
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G. W. Thornburgh
Roger L. Tindall
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