



# Prairie Information Sheet

Conservation Practice Information Sheet (IS-MO643P)

## Restoring or Recreating a Tallgrass Prairie

### What is a Tallgrass Prairie?

Prairie comes from the French word for a grassy meadow. Prairies are diverse grasslands with an abundance of different grasses, rushes, sedges and wildflowers (forbs) and few woody plants. More than 800 plant species have been identified on Missouri's prairies. Many wildlife species are endemic to the tallgrass prairie, with insects being the most abundant life form.

Historically, prairies covered over one-third of Missouri. Much of northern and southwest Missouri were originally prairie, but prairie also extended into the open pine forests of the Ozarks, and even into the swampy land on sandy ridges in the southeast. Today, fewer than 75,000 acres of Missouri's original prairie remains. Most remnant prairies occur in southwest Missouri in areas too hilly or rocky to plow. Tallgrass prairies are now considered one of the most threatened plant communities in the Midwest and among the most threatened in the world.

Prairies are complex communities, made up of an array of different grasses, flowering plants, and very few trees and shrubs. Some examples of flowering plants of the tallgrass prairie include pale purple coneflower (*Echinacea pallida*), prairie blazing star (*Liatris pycnostachya*), white wild indigo (*Baptisia leucantha*), rosinweed (*Silphium perfoliatum*), rattlesnake master (*Eryngium yuccifolium*), purple prairie clover (*Dalea purpurea*), lead plant (*Amorphia canescens*), gray goldenrod (*Solidago nemoralis*), and ashy sunflower (*Helianthus mollis*). Common grasses include prairie dropseed (*Sporobolus heterolepis*), little bluestem (*Andropogon scoparius*), big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), prairie cord grass (*Spartina pectinata*), June grass (*Koeleria cristata*) and Canada wild rye (*Elymus Canadensis*). Wild plum (*Prunus spp.*), New Jersey tea (*Ceanothus americanus*), pasture rose (*Rosa Carolina*), and prairie willow (*Salix humilis*) are a few shrubs common to the prairie. Bur Oak (*Quercus macrocarpa*) is one of only a few tree species adapted to prairie life.



The first European settlers described the prairie as a vast fertile grassland with an abundance of game and deep, productive soil for cultivating. Early pioneers also portrayed the prairie as a difficult place to live because of the harsh conditions.

Fire and herbivores played an important role in shaping Missouri prairies. Prairie plants have adapted to fire and grazing and harsh weather conditions by developing an extensive root system. Many prairie plants have root systems that can penetrate fifteen feet or more below ground. As much as thirty percent of a plant's root system is replaced annually. This well developed root system also helped form the rich, organic soils found on the prairie, which ultimately led to its destruction by the plow.



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Fire played an important roll in rejuvenating the prairie. Native Americans started fires to protect their villages, to attract game, provide grazing areas for their horses, and as a weapon against other villages. Fires were also started by lightning strikes, especially during summer thunderstorms. Fire prevented woody vegetation from invading the prairie and helped to revitalize the herbaceous vegetation by removing the previous year's growth. Herbivores such as bison and elk were attracted to recently burned areas for the lush new growth. The combination of fire and grazing, or lack of, kept the prairie in various stages of vegetative growth.

When settlement eliminated fire and large herbivores from Missouri, most prairies were quickly invaded by shrub and trees. The invention of the steel moldboard plow, which made it easier for settlers to break the tough prairie sod, ultimately led to the destruction of the prairie. Today, much of the original tallgrass prairie region is the breadbasket for the world. Only a few isolated patches of the original tallgrass prairie remain. Many prairie remnants have been degraded by overgrazing, herbicide treatments, improper management and the introduction of nonnative plants. Invasive, nonnative plants such as tall fescue, brome, serecia lespedeza and sweet clover pose a serious threat to the few remnant prairies because they misplace native vegetation and provide poor habitat for wildlife.

## Types of Tallgrass Prairie

Missouri's prairies are classified into several natural communities based on soil moisture and geologic strata. Most prairies can be categorized as dry, mesic or wet prairies. Different types of prairies may exist in the same field because of topography and soil moisture. Each type of prairie also supports different flora and fauna.

**Dry Prairies** are the most common type of prairie still remaining in Missouri today because the shallow, rocky soils were difficult to plow. Dry prairies often occur on ridge tops and along the slopes of the prairie, especially on south and west facing hillsides. Dry prairies are often interspersed with mesic to wet prairies in the valleys and swales. Big bluestem, little bluestem, sideoats grama, Indian grass and switchgrass are common grasses found on dry prairies. Other native grasses, sedges and rushes are also common to dry prairies. High quality, dry prairies may have several hundred species of forbs. Commonly forbs include many aster, goldenrod and sunflower species, pale purple coneflower, coreopsis, leadplant, wild quinine, prairie dock, rosinweed, goats rue, purple and white prairie clover, prairie beard tongue, blue sage, and rough blazing star.



**Loess Hill Prairies** are a rare type of dry prairie confined to northwestern Missouri along a narrow band on the eastern edge of the Missouri River. Loess hill prairies are characterized by their deep, rich soils which were created by wind-blown deposits of fine, glacial dust known as loess. Loess hill prairies have extremely steep slopes and well-drained soils which influence the vegetation found on the site. Hill prairies are the only example in Missouri of a mix-grass prairie community, which contains plants representative of a tallgrass prairie and the short-grass prairies of the western Great Plains. Common loess hill prairie plants include lead plant, scurfy pea, aromatic aster, large beardtongue, yucca, rough false foxglove, scaly blazing star, hairy grama grass, side-oats grama and little bluestem.



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**Sand prairies** are another type of dry, loess prairie found in Missouri. Historically, sand prairies occurred along sandy ridges in southeast and northeast Missouri. Most sand prairies have been destroyed by cultivation or mining for the sand. Vegetation on sand prairies is often thin and sparse because of the extremely dry conditions and continual shifting of the sand. Broomsedge, little bluestem, sand dropseed are few grasses found on sand prairies. Sedges are also common. Common forbs include coreopsis, tick trefoil, golden aster, spotted bee balm, goat's rue, gray goldenrod, sensitive briar, black-eyed Susan and mountain mint.



At one time **Mesic prairies** were the most common and diverse prairies found in Missouri. Mesic prairies are well-drained, but have moist soils with clay or loam substrates. Only a few small mesic prairies remain today because nearly all have been destroyed and converted to cropland or other agricultural uses. Mesic prairies can range from dry-mesic to wet-mesic depending on soil characteristic and the water table level. This is one reason why mesic prairies are so diverse. Big bluestem, Indian grass and cordgrass (on wet-mesic prairies) are common grass species. Other grasses may include Canada wild rye, switchgrass and many native sedges and rushes. Purple coneflower, prairie blazing star, rattlesnake master, rosinweed, sweet coneflower, New England aster, grayhead coneflower, royal catchfly and white wild indigo are a few of the many wildflowers common to mesic prairies.

**Wet prairies** are found on sites with saturated soils throughout much of the year. Wet prairies may occur along major rivers, areas with a high water table or around seeps and springs. Most wet prairies have been plowed and converted to cropland. Common wet prairie plants include prairie cordgrass, switchgrass, Canada wild rye and numerous sedges and rushes. Blue flag, cardinal flower, cup plant, ironweed, marsh milkweed, beardtongue, tall coreopsis, brown-eyed Susan, bonesets, goldenrods and asters are typical wildflowers.



## Recreating a Tallgrass Prairie

A tallgrass prairie design for a new undeveloped field should take into account management objectives, topography, soils, presettlement history and cost. Consider using adapted seed mixtures for each type of prairie to be recreated in a field. Seeds or plant materials that genetically originated within a 150 mile radius of the planting site or within the same Missouri Ecotype Zone are preferred over improved varieties (cultivars).

This practice should only be applied on fields with grassland or transitional derived soils that comprise at least 50 percent of the field primarily in upland landscapes.



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Prepare fields for seeding by eradicating all existing vegetation. Consider using chemical burndown, mowing, light disking or a combination of these practices to eradicate undesirable vegetation from the site. Several treatments may be necessary to eradicate undesirable vegetation. Typically, two well-timed chemical burndown treatments are usually adequate. Old fields and fallow areas may require multiple treatments for one or two growing seasons to eradicate aggressive weeds. Avoid disking as the last treatment before seeding since this will only allow more weeds to germinate. A cover crop of oats can be seeded on fields prone to erosion, especially if the site will require more than one year to prepare.

Dormant seeding is the recommended establishment method. Seeds can either be broadcasted or drilled, being careful not to drill the seed too deep. Dormant seeding is the preferred method because the actions of freezing and thawing will work the seed into the ground to the correct depth. A spilt seeding is the next best method. It is recommended that the forbs be planted first in late fall or early winter when soil and air temperatures will remain cold enough to prevent germination. The grass component is then added one year after the forb seeding using the no-till method. Spring seeding is the least desirable seeding period and should be avoided if possible.

**Grasses:** Plant a total of 5 pounds PLS of any combination of at least 4 species (see list below). Switchgrass, big bluestem, Indian grass, eastern gamagrass, tall dropseed, and prairie dropseed should be limited to not more than ¼ pound PLS per acre. Sideoats grama will be limited to not more than 1 pound PLS per acre. All other grass species should be planted at not less than 1 pound PLS per acre. Additional grass species can be added at lesser amounts for diversity to equal the 5 pound PLS mix. Suitable grasses for the different types of prairies are listed on the next page.

No more than ¼ lb PLS/ac

Big bluestem	<i>Andropogon gerardii</i>
Indian grass	<i>Sorghastrum nutans</i>
Switchgrass	<i>Panicum virgatum</i>
Eastern gamagrass	<i>Tripsacum dactyloides</i>
Tall dropseed	<i>Sporobolus compositus</i>
Prairie dropseed	<i>Sporobolus heterolepis</i>

No less than 1 lb PLS/ac

Canada wild rye	<i>Elymus Canadensis</i>
Virginia wild rye	<i>Elymus virginicus</i>
Little bluestem	<i>Schizachyrium scoparium</i>

No more than 1 lb PLS/ac

Sideoats grama	<i>Bouteloua curtipendula</i>
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Wet prairies will require a specific seeding mix as recommended by a biologist. If establishing prairie cordgrass, one gallon containers should be used. Containers should be quartered to create 220 plugs which are then planted on a 10 x 20 foot grid. Plant prairie cordgrass anytime from mid June through mid July. Prepare the field for planting by light disking, chemical burndown or mowing existing vegetation. A tractor mounted tree planter can be used to aid in planting.

**Forbs (Wildflowers):** A minimum of 10 forb species should be selected with the mixture being a minimum of one-half pound PLS per acre with no single species exceeding 15% of the forb mixture and the mix having no more than 15% annual/biennial species combined. Forbs for the different types of prairie are listed on the next page.



Indian paintbrush often flowers heavily following a summer or fall prescribed burn or late summer haying. Annual and biennial plants are dependent on disturbances from fire or herbivores to create open ground for seeds to germinate. Perennial species still make up a majority of the plants found on a prairie.



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## Recommend Grasses and Forbs for Missouri Prairie Types

### DRY TALLGRASS PRAIRIE

#### **Dominant Grasses**

Little bluestem  
Sideoats grama

#### **Other Grasses**

Big bluestem  
Prairie dropseed

#### **Common Forbs and Legumes**

Leadplant *Amorpha canescens*  
Aromatic aster *Aster oblongifolius*  
Sky blue aster *Aster oolentangiensis*  
Silky aster *Aster sericeus*  
Blue wild indigo *Baptisia australis*  
Cream wild indigo *Baptisia bracteata*  
Purple poppy mallow *Callirhoe involucrata*  
Indian paintbrush *Castilleja coccinea*  
New Jersey tea *Ceanothus americanus*  
Partridge pea *Chamaecrista fasciculata*  
Coreopsis *Coreopsis lanceolata* or *grandiflora*  
Prairie coreopsis *Coreopsis palmata*

Rattlebox *Crotalaria sagittalis*  
Purple prairie clover *Dalea purpurea*  
White prairie clover *Dalea candida*  
Tick trefoils *Desmodium spp.*  
Pale purple coneflower *Echinacea pallida*  
Yellow coneflower *Echinacea paradoxa*  
Flowering spurge *Euphorbia corollata*  
Gumweed *Grindelia lanceolata*  
Maxmillian sunflower *Helianthus maximiliani*  
Ashy Sunflower *Helianthus mollis*  
Sawtooth sunflower *Helianthus grosseserratus*  
Western sunflower *Helianthus occidentalis*  
Roundhead bushclover *Lespedeza capitata*  
Slender bush clover *Lespedeza virginica*  
Blazing stars *Liatris spp.*  
Sampson's snakeroot *Orbexilum pedunculatum*  
Wild quinine *Parthenium integrifolium*  
Wood betony *Pedicularis canadensis*  
Scurf pea *Pedimentum argophyllum*

Prairie beardtongue *Penstemon tubaeformis*  
Pale beard tongue *Penstemon pallidus*  
Prairie cinquefoil *Potentilla arguta*  
Scurfy pea *Psoraleidum tenuiflorum*  
Slender mountain mint *Pycnanthemum tenuifolium*  
Hairy mountain mint *Pycnanthemum verticillatum*  
Prairie coneflower *Ratibida columnifera*  
Gray-head coneflower *Ratibida pinnata*  
Black-eyed Susan *Rudbeckia hirta*  
Missouri black-eyed Susan *Rudbeckia missouriensis*  
Wild petunia *Ruellia humilis*  
Pitchers sage *Salvia azurea*  
Compass Plant *Silphium laciniatum*  
Prairie Dock *Silphium terebinthinaceum*  
Blue-eyed grass *Sisyrinchium campestre*  
Grass-leaved goldenrod *Solidago gymnospermoides*  
Gray goldenrod *Solidago nemoralis*  
Goat's rue *Tephrosia virginiana*

### MESIC TALLGRASS PRAIRIE

#### **Dominant Grasses**

Little bluestem  
Sideoats grama  
Big bluestem

#### **Other Grasses**

Indian grass  
Eastern gamma grass  
Prairie dropseed  
Switchgrass  
Canada wild rye

#### **Common Forbs and Legumes**

Yarrow *Achillea millefolium*  
Leadplant *Amorpha canescens*  
Indian plantains *Arnoglossum spp.*  
Butterfly milkweed *Asclepias tuberosa*  
Spider milkweed *Asclepias viridis*  
Aromatic aster *Aster oblongifolius*  
Sky blue aster *Aster oolentangiensis*  
White wild indigo *Baptisia alba*  
Cream wild indigo *Baptisia bracteata*  
Indian paintbrush *Castilleja coccinea*  
New Jersey tea *Ceanothus americanus*  
Partridge pea *Chamaecrista fasciculata*  
Coreopsis *Coreopsis lanceolata* or *grandiflora*

Prairie coreopsis *Coreopsis palmata*  
Tall coreopsis *Coreopsis tripteris*  
Purple prairie clover *Dalea purpurea*  
White prairie clover *Dalea candida*  
Illinois bundle flower *Desmanthus illinoensis*  
Tick trefoils *Desmodium spp.*  
Pale purple coneflower *Echinacea pallida*  
Purple coneflower *Echinacea purpurea*  
Rattlesnake master *Eryngium yuccifolium*  
Flowering spurge *Euphorbia corollata*  
Sawtooth sunflower *Helianthus grosseserratus*  
False sunflower *Heliopsis helianthoides*  
Maxmillian sunflower *Helianthus maximiliani*  
Ashy sunflower *Helianthus mollis*  
Western sunflower *Helianthus occidentalis*  
Roundhead bushclover *Lespedeza capitata*  
Slender bush clover *Lespedeza virginica*  
Blazing stars *Liatris spp.*  
Sensitive briar *Mimosa quadrivalvis*  
Bergamot *Monarda fistulosa*  
Wild quinine *Parthenium integrifolium*  
Scurf pea *Pedimentum argophyllum*  
Beardtongue *Penstemon digitalis*  
Wood betony *Pedicularis canadensis*

Obedient plant *Physostegia virginiana*  
Hairy mountain mint *Pycnanthemum verticillatum*  
Slender mountain mint *Pycnanthemum tenuifolium*  
Prairie cinquefoil *Potentilla arguta*  
Scurfy pea *Psoraleidum tenuiflorum*  
Prairie coneflower *Ratibida columnifera*  
Gray-head coneflower *Ratibida pinnata*  
Sweet coneflower *Rudbeckia subtomentosa*  
Rosinweed *Silphium integrifolium*  
Compass Plant *Silphium laciniatum*  
Prairie Dock *Silphium terebinthinaceum*  
Black-eyed Susan *Rudbeckia hirta*  
Pitchers sage *Salvia azurea*  
Royal catchfly *Silene regia*  
Showy goldenrod *Solidago speciosa*  
Stiff goldenrod *Solidago rigida*  
Grass-leaved goldenrod *Solidago gymnospermoides*  
Gray goldenrod *Solidago nemoralis*  
Goat's rue *Tephrosia virginiana*  
Ohio spiderwort *Tradescantia ohiensis*  
Ironweeds *Vernonia spp.*  
Golden Alexanders *Zizia aurea*



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## **WET TALLGRASS PRAIRIE**

### **Dominant Grasses**

Big bluestem  
Prairie cordgrass  
Canada wild rye  
Virginia wild rye  
Native sedges

### **Other Grasses**

Swichgrass  
River oats

### **Common Forbs and Legumes**

Meadow anemone *Anemone canadensis*  
Indian plantains *Arnoglossum spp.*  
Marsh milkweed *Asclepias incarnata*  
New England aster *Aster novae-angliae*  
Willow aster *Aster praealtus*

White wild indigo *Baptisia alba*  
Spanish needles *Bidens spp.*  
Tall coreopsis *Coreopsis tripteris*  
Illinois bundle flower *Desmanthus illinoensis*  
Tick trefoils *Desmodium spp*  
Purple coneflower *Echinacea purpurea*  
Bonesets *Eupatorium spp.*  
Joe pye weeds *Euatorium spp.*  
Maxmillian sunflower *Helianthus maximilianii*  
Sawtooth sunflower *Helianthus grosseserratus*  
False sunflower *Heliopsis helianthoides*  
Cardinal flower *Lobelia cardinalis*  
Blue lobelia *Lobelia siphilitica*  
Blue flag *Iris virginica*

Bergamot *Monarda fistulosa*  
Beardtongue *Penstemon digitalis*  
Obedient plant *Physostegia virginiana*  
Hairy mountain mint *Pycnanthemum verticillatum*  
Brown-eyed Susan *Rudbeckia triloba*  
Sweet coneflower *Rudbeckia subtomentosa*  
Maryland senna *Senna marilandica*  
Prairie Dock *Silphium terebinthinaceum*  
Cup plant *Silphium perfoliatum*  
Riddell's goldenrod *Solidago riddellii*  
Ohio spiderwort *Tradescantia ohioensis*  
Blue vervain *Verbena hastata*  
Culver's root *Veronicastrum virginicum*  
Ironweeds *Vernonia spp.*  
Golden alexander *Zizia aurea*

**Shrubs:** Consider establishing shrubs to create shrubby cover in fields where it is lacking. Historically, a few islands of shrubs would have been found along streams and in areas that did not burn as frequent as the rest of the prairie. Shrub islands provide loafing and nesting sites for grassland wildlife. Small clusters of shrub islands should be widely scattered across the field, and should make up no more than 5% of the field. Each island should be at least 30 x 50 feet and the shrubs within the islands planted on a 5 x 5 foot spacing.

### **Prairie Shrubs**

Gray or roughleaf dogwood  
Prairie willow  
American or Chickasaw plum

*Cornus spp.*  
*Salix humilis*  
*Prunus spp.*

Choke cherry  
Fragrant sumac  
False indigo bush

*Prunus virginiana*  
*Rhus aromatica*  
*Amorpha fruticosa*

## **Management Recommendations for New Seedlings**

During the first growing season mow the new planting when weed competition reaches a height of two feet. Vegetation should be cut to a height of four to six inches and shredded to reduce smothering. This will not hurt the native grass and forb seedlings as most plants will be less than six inches tall the first year. Eradicate invasive weeds with a herbicide application or mowing.

Prescribed burning should be conducted no earlier than the beginning of the second growing season. If the field can not be burned the second year, mow in early spring to reduce weed competition. Once the prairie is established burning can occur every year or divided the field in thirds and burn a different one-third each year to provide a mosaic of different vegetative habitats. Control undesirable woody vegetation and invasive perennial plants. *It is recommended that you request a prescribed burn plan before conducting a prescribed burn.*





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## Restoration and Management Techniques for Tallgrass Prairie Remnants

### **What is a Remnant?**

Prairie remnants are sites that still have some of the characteristic species of the tallgrass prairie. Generally, remnants have not been cultivated and often invasive perennial plants and woody vegetation are present. Most prairie remnants are small, isolated patches such as roadside or railroad ditches. Remnants may also occur in old fields, overgrazed pastures and hay meadows.

### **Restoring an existing Remnant**

With remnants it is often best to attempt restoration through management techniques such as prescribed burning, herbicide treatments, woody cover control, and interseeding with the desired species. Restoration is a slow process and it may take several years to restore a remnant.

Prescribed burning is the preferred method used to restore and maintain prairie. Plan to burn one-third of the field each year, varying the season in which you burn to target invasive species or create different types of vegetative structure. In some cases it may be necessary to burn each year, especially if invasive cool-season grasses or woody vegetation are a problem. Late spring burns are an effective way to temporarily control woody vegetation and aggressive cool-season grasses. Summer and fall burns will setback warm-season grasses and enhance wildflower production the following year. Late summer burns are also an effective way to temporarily control sercia lespedeza and woody vegetation.

Herbicide burndown treatments are often necessary to eradicate invasive plants from a site. Consider the use of selective herbicides to remove exotic grasses or forbs. Tall fescue, brome, reed canary grass, sercia lespedeza and sweet clover are a few of the many exotic plants that invade prairies. To eradicate invasive cool-season grasses consider burning or haying the area prior to the herbicide treatment. Doing so will improve the effectiveness of the herbicide applied. If applying herbicides in the fall, a summer or early fall burn will work best. If spraying herbicides in the spring, burn in late winter or early spring so the target species will have time to regrow before the chemical application. Sercia lespedeza should be sprayed during the summer and avoid spraying during a drought.

Undesired woody vegetation should be cut down and stumps treated with a herbicide to prevent regrowth. Remove trees and shrubs so that no more than 10% remains. If desired, stack and burn woody material or leave it for temporarily cover. In time, prescribed burning will remove most of the dead woody vegetation.

Annual haying or mowing are also effective ways of controlling woody vegetation. These practices should not be used as an alternative to prescribed burning because these methods do little to enhance the grassland and the wildlife it supports. Haying and mowing should be limited to areas where woody vegetation is a problem. Cutting should be delayed until after July 15<sup>th</sup> to avoid the primary nesting season and to have the greatest impact on woody vegetation.

*Photos courtesy of the Missouri Department of Conservation.*

*For additional information on tallgrass prairie, contact your local USDA Service Center or Missouri Department of Conservation office.*

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