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 oak and pine forests of the Ozarks, and even dry sandy ridges surround by the swampy land 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 Lewis and Clark Expedition described the prairie as a vast fertile grassland with an abundance of game and deep, productive soil for cultivating. However, early settlers portrayed the prairie as a difficult place to live because of the harsh and barren 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.

Prairie Information Sheet

Conservation Practice Information Sheet ***(IS-MO643P)***

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, many 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 cultivated and considered 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 remnant prairies because they misplace native vegetation and create 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 changes in 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 common 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.

Sand prairies are another type of dry 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 urbanization. Vegetation on sand prairies is often thin and sparse because of the extremely dry conditions and continual shifting of the sand. Broomsedge, split beard bluestem, 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** where 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. Once common to northeastern Missouri, **Hardpan prairies** are a type of mesic prairie formed over poorly drained soils with clayey subsoils. 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, prairie dropseed, 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.

Prepare fields for seeding by eradicating all existing vegetation. Consider using herbicide applications, 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 herbicide applications are usually adequate. Old fields and fallow areas may require multiple treatments for one or two growing seasons to eradicate aggressive species. Avoid disking as the last treatment before seeding since this will only allow more weeds to germinate. A cover crop of oats, not wheat, can be seeded on fields prone to erosion, especially if the site will require more than one year to prepare.

Dormant seeding is the only recommended establishment method. Seeds can either be broadcasted or drilled. Be 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.

Seeding Prairies

Native forbs and grasses need to be seeded to insure plant diversity. See NRCS FOTG practice standard - RESTORATION and MANAGEMENT OF RARE or DECLINING HABITAT (643) for recommended rates. Consult with a conservationist to determine if only forbs, only grasses or both forbs and grasses should be seeded. See the attached seeding tables for recommended species.

Indian paintbrush often flowers heavily following a summer or fall prescribed burn or late summer haying. Annual and biennial prairie 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.

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 and shrubland 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	*Cornus spp.*	Hazelnut	*Corylus americana*
Prairie willow	*Salix humilis*	Fragrant sumac	*Rhus aromatica*
American or Chickasaw plum	*Prunus spp.*	False indigo bush	*Amorpha fruticosa*

Management Recommendations for New Seedings

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. *A prescribed burn plan should be developed before conducting a prescribed burn.*

Prairie Information Sheet

Conservation Practice Information Sheet ***(IS-MO643P)***

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 along roadsides or railroad right of ways. Remnants may also occur in old fields, overgrazed pastures and hay meadows.

Restoring an existing Remnant

It is 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.

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 exotic cool-season grasses. On the other hand, summer and fall burns will setback warm-season grasses and enhances wildflower production the following year. Late summer burns are also an effective way to temporarily control serecia lespedeza and woody vegetation.

Herbicide 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, smooth brome, reed canary grass, serecia 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. Serecia lespedeza should be sprayed during the summer and avoid spraying during a drought.

In some cases it may be necessary and beneficial to interseed wildflowers to increase plant diversity and to establish a forb component in a remnant dominated by native grasses. Follow guidelines and seeding rates described in "Recreating a Tallgrass Prairie" on page 4. Interseed wildflowers after a disturbance, such as a prescribed burn or herbicide application, since it is essential that seeds have contact with bare soil. Interseeding should also be completed during the dormant season so plan accordingly. Patience is the key as it may take two to five years before wildflowers begin to bloom.

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, and eventually phased out of the management plan and replaced with prescribed burning once woody vegetation is under control. Cutting should be delayed until after July 15th to avoid the primary nesting season and to have the greatest impact on woody vegetation.

In many cases prairie remnants are annually hayed to support a grazing system. If possible, consider resting a portion of the prairie each year to allow native vegetation to recover from past annual haying. Resting a portion of the prairie will provide critical habitat for grassland wildlife. Rest blocks, rather than linear sections, as this will provide better nesting cover for grassland birds.

Soil amendments are not necessary or recommended when the primary concern is to manage the prairie remnant for plant and animal diversity and not production. However, consider amending to meet soil test recommendations when site conditions suggest the need for fertility supplement and the goal is to maintain the prairie for only grazing or hayland production. Grazed and hayed remnants may benefit from the addition of lime and the macronutrients, phosphorus and potassium. In many cases amending with lime may be sufficient. Care should be taken to limit the amount of nitrogen applied as this will only encourage exotic cool-season grass competition. Use the fertilizer blend (N-P-K) with the lowest ratio of nitrogen possible. Apply nutrients in late fall or early winter to minimize negative impacts that may result to nesting grassland wildlife and native plant diversity.

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

Photos courtesy of the Missouri Department of Conservation. 2004.

TABLE 1 – APPROVED GRASS/GRASS LIKE – species selection will only be made from appropriate habitat type based on planting site evaluation.

Common Name	Scientific Name	Habitat Type *
GRASSES/GRASS LIKE		
Winter bent grass	*Agrostis hyemalis*	S, DP, MP, WP
Big bluestem	*Andropogon gerardii*	S, DP, MP, WP, G
Splitbeard bluestem	*Andropogon ternarius*	DP, G
Broomsedge	*Andropogon virginicus*	S, DP, MP, WP, G
Sideoats grama	*Bouteloua curtipendula*	S, DP, MP, G
River oats	*Chasmanthium latifolium*	S, MP, WP
Canada wildrye	*Elymus canadensis*	S, MP, WP
Virginia wildrye	*Elymus virginicus*	S, MP, WP, G
Cluster fescue	*Festuca paradoxa*	S, DP, MP, WP
Junegrass	*Koeleria cristata*	S, DP, MP
Switchgrass	*Panicum virgatum*	S, DP, MP, WP, G
Beaked rush	*Rhynchospora globularis*	MP, WP
Little bluestem	*Schizachyrium scoparium*	S, DP, MP, G
Tall nutgrass	*Scleria triglomerata*	S, DP, MP, WP, G
Indian grass	*Sorghastrum nutans*	S, DP, MP, G
Prairie cordgrass	*Spartina pectinata*	WP
Tall dropseed	*Sporobolus compositus*	S, DP, MP, G
Prairie dropseed	*Sporobolus heterolepis*	S, DP, MP, G
Porcupine grass	*Stipa spartea*	DP, MP
Purple top	*Tridens flavus*	S, MP
Eastern gamagrass	*Tripsacum dactyloides*	S, DP, MP, WP
Short's sedge	*Carex shortiana*	S, MP, WP
Six weeks fescue	*Vulpia octoflora*	S, DP, MP, G

*** S = Oak Savanna, DP = Dry Prairie, MP = Mesic Prairie, WP = Wet Prairie, G = Glade**

TABLE 2 – APPROVED FORBS - species selection will only be made from appropriate habitat type based on planting site evaluation.

Common Name	Scientific Name	Habitat Type *
	FORBS	
Yarrow	*Achillea millefolium*	MP
Leadplant	*Amorpha canescens*	S, DP, MP, G
Meadow anemone	*Anemone canadensis*	WP
Purple milkweed	*Asclepias purpurascens*	S
Marsh milkweed	*Asclepias incarnata*	WP
Butterfly milkweed	*Asclepias tuberosa*	S, DP, MP, G
Sky blue aster	*Aster azureus*	S, DP
Smooth aster	*Aster laevis*	S
New England aster	*Aster novae-angliae*	WP
Aromatic aster	*Aster oblongifolius*	DP, MP, G
Purple daisy aster	*Aster patens*	
Willow aster	*Aster praealtus*	WP
Silky aster	*Aster sericeus*	DP, G
White wild indigo	*Baptisia alba*	S, DP, MP, WP, G
Blue wild indigo	*Baptisia australis*	S, DP, MP, WP, G
Cream wild indigo	*Baptisia bracteata*	DP, MP, G
Beggar tick **(A)**	*Bidens frondosa*	WP
Fringed poppy mallow	*Callirhoe digitata*	DP, MP
Purple poppy mallow	*Callirhoe involucrata*	DP, G
Prairie hyacinth	*Camassia angusta*	MP, WP
Partridge pea **(A)**	*Cassia fasciculata*	S, DP, MP, G
Indian paintbrush **(A)**	*Castilleja coccinea*	DP, MP, WP, G
New Jersey tea	*Ceanothus americanus*	S, DP, MP, G
Grandiflora coreopsis	*Coreopsis grandiflora*	DP, MP
Coreopsis	*Coreopsis lanceolata*	DP, MP, G
Finger/Prairie Coreopsis	*Coreopsis palmata*	S, DP, MP, G
Plains coreopsis	*Coreopsis tinctoria*	DP, G
Tickseed coreopsis	*Coreopsis tripteris*	S, DP, MP, WP, G
Rattlebox	*Crotalaria sagittalis*	DP, G
White prairie clover	*Dalea candida*	S, DP, MP, G
Purple prairie clover	*Dalea purpurea*	S, DP, MP, G
Illinois bundle flower	*Desmanthus illinoensis*	MP, WP, G
Showy tick trefoil	*Desmodium canadense*	S, DP, MP, WP, G
Beggar's lice	*Desmodium canescens*	S, DP, MP, G
Shooting star	*Dodecatheon meadia*	S, DP, G
Pale purple coneflower	*Echinacea pallida*	S, DP, MP, G
Yellow coneflower	*Echinacea paradoxa*	S, DP, G
Purple coneflower	*Echinacea purpurea*	S, MP, WP, G
Ozark glade coneflower	*Echinacea simulata*	S, DP, MP, G
Rattlesnake master	*Eryngium yuccifolium*	S, DP, MP, G
Boneset	*Eupatorium perfoliatum*	WP
Flowering spurge	*Euphorbia corollata*	S, DP, MP, G
Curly cup gum plant	*Grindelia lanceolata*	S, DP, MP, G

Common Name	Scientific Name	Habitat Type *
Sawtooth sunflower	*Helianthus grosseserratus*	DP, MP, WP, G
Ashy Sunflower	*Helianthus mollis*	DP, MP, G
Western sunflower	*Helianthus occidentalis*	DP, MP, G
Woodland sunflower	*Helianthus strumosus*	S
Ox-eye/false sunflower	*Heliopsis helianthoides*	S, DP, MP, G
Alum root	*Heuchera richardsonii*	DP, G
Copper flag	*Iris fulva*	MP, WP
Blue flag	*Iris virginica shrevei*	WP
Roundhead lespedeza	*Lespedeza capitata*	S, DP, MP, G
Lespedeza hirta	*Lespedeza hirta*	S, DP, MP, G
Slender lespedeza	*Lespedeza virginica*	S, DP, MP, G
Rough blazing star	*Liatris aspera*	S, DP, G
Glade blazing star	*Liatris mucronata*	S, DP, G
Blazing star	*Liatris pycnostachya*	DP, MP, WP, G
Squarrosa blazing star	*Liatris squarrulosa*	S, DP, MP, G
Cardinal flower	*Lobelia cardinalis*	WP
Blue lobelia	*Lobelia siphilitica*	WP
Barbara's button	*Marshallia caespitosa*	DP, MP, WP
Sensitive briar	*Mimosa nuttalli*	S, DP, MP, G
Savanna bergamot	*Monarda bradburiana*	S, DP, G
Bergamot	*Monarda fistulosa*	S, DP, MP, WP, G
Missouri Primrose	O*enothera missouriensis*	DP,G
Sampson's snakeroot	*Orbexilum pedunculatum*	S, MP, WP
Spanish needles	*Palafoxia callosa*	S, DP, G
Wild quinine	*Parthenium integrifolium*	S, DP, MP, G
Lousewort/Wood betony	*Pedicularis canadensis*	DP, MP, G
Purple beardtongue	*Penstemon cobaea*	S, DP, G
Beardtongue	*Penstemon digitalis*	DP, MP, WP, G
Prairie beardtongue	*Penstemon tubaeflorus*	S, DP, MP
Obedient plant	*Physostegia virginiana*	S, MP, WP, G
Prairie parsley	*Polytaenia nuttallii*	DP, MP, WP
Prairie cinquefoil	*Potentilla arguta*	DP, MP, G
Scurfy pea	*Psoralidium tenuiflorum*	MP, WP
Slender mountain mint	*Pycnanthemum tenuifolium*	S, DP, MP, WP, G
Mountain mint	*Pycnanthemum virginianum*	WP
Prairie coneflower	*Ratibida columnifera*	DP, MP, G
Gray-head coneflower	*Ratibida pinnata*	S, DP, MP, G
Prairie rose	*Rosa setigera*	MP
Black-eyed Susan **(B)**	*Rudbeckia hirta*	S, DP, MP, G
Missouri Black-eyed Susan	*Rudbeckia missouriensis*	DP, G
Sweet coneflower	*Rudbeckia subtomentosa*	MP, WP
Brown-eyed Susan	*Rudbeckia triloba*	WP
Wild petunia	*Ruellia humilis*	DP, G
Pitchers sage	*Salvia azurea*	DP, MP, G
Maryland senna	*Senna marilandica*	S, MP, WP
Royal catchfly	*Silene regia*	S, DP, MP
Rosinweed	*Silphium integrifolium*	S, DP, MP, WP, G

Common Name	Scientific Name	Habitat Type *
Compass Plant	*Silphium laciniatum*	DP, MP, WP, G
Cup plant	*Silphium perfoliatum*	WP
Prairie dock	*Silphium terebinthinaceum*	S, DP, MP, WP, G
Blue-eyed grass	*Sisyrinchium campestre*	DP
Gray goldenrod	*Solidago nemoralis*	S, DP, MP, G
Savanna goldenrod	*Solidago petiolaris*	S, DP, G
Riddell's goldenrod	*Solidago riddellii*	WP
Rigid/Stiff goldenrod	*Solidago rigida*	S, DP, MP, WP, G
Showy goldenrod	*Solidago speciosa*	S, DP, MP
Goat's rue	*Tephrosia virginiana*	S, DP, MP, G
Ohio spiderwort	*Tradescantia ohiensis*	S, DP, MP, WP
Blue vervain	*Verbena hastata*	WP
Wingstem sunflower	*Verbesina helianthoides*	S, DP, MP
Ironweed	*Vernonia missurica*	MP, WP
Culver's root	*Veronicastrum virginicum*	S, MP, WP
Golden alexander	*Zizia aurea*	S, DP, MP, WP, G

*** S = Oak Savanna, DP = Dry Prairie, MP = Mesic Prairie, WP = Wet Prairie, G = Glade**

A = Annual **B = Biennial**