



Savanna Information Sheet

Conservation Practice Information Sheet

(IS-MO643s)

Designing an Oak Savanna

What is an Oak Savanna?

Although definitions vary, one common definition is: *an oak savanna is a plant community with scattered “open-grown” fire tolerant oak trees*. Other terms for these savannas are “oak openings” and “barrens”. In contrast to a forest, which has a closed canopy, the oak savanna canopy ranges from about 10% to 30%. In such a habitat, the ground layer receives sun and shade, which permits growth of a wide diversity of grasses and flowering plants. There is usually enough sun to the ground to permit the growth of typical prairie species, such as big and little bluestem grass, and many goldenrods and asters.

Oak savannas have their own characteristic and complex communities of ground-layer grasses, flowering plants, and shrubs. A few examples of flowering plants of the savanna include white wild indigo (*Baptisia leucantha*), lead plant (*Amorpha canescens*), purple coneflower (*Echinacea purpurea*), round-headed bush clover (*Lespedeza capitata*) and blue aster (*Aster anomalis*). Common savanna shrubs are New Jersey tea (*Ceanothus americanus*), hazelnut (*Corylus americana*), and pasture rose (*Rosa carolina*).



Early settlers to the Midwest described the park-like setting of oak savannas. At one time these savannas and open woodlands were common throughout the landscape of Missouri. An oak savanna is a transitional form between tall grass prairie in the west and deciduous forest in the east. Although there is a continuum from prairie to savanna to forest, oak savannas are still considered a distinct vegetation type.

An oak savanna is a fire-controlled vegetation community. With settlement, fires were eliminated and the savanna changed into denser forested landscapes, losing the characteristic open tree canopy with grass and forb understory. Grazing by bison and elk may also have helped keep the savanna open. When settlement eliminated these animals and fire from Missouri, most of the savanna acreage experienced an invasion by dense shrub and tree growth.

Oak savannas are now considered one of the most threatened plant communities in the Midwest and among the most threatened in the world. Less than 0.01% of the original savanna community remains.



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What Should an Oak Savanna Look Like?

Savanna design for a new undeveloped field should take into account management objectives, topography, soils, presettlement history and cost.



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

Species selection for trees

A minimum of two native tree species should be used from an approved list for savanna species. Normally, bur oak should be a predominant tree species in the northern 2/3 of Missouri and post oak in the southern 1/3 of the state.

Suggested Trees:

Black oak	<i>Quercus velutina</i>	White oak	<i>Quercus alba</i>
Blackjack oak	<i>Quercus marilandica</i>	Swamp white oak	<i>Quercus bicolor</i>
Bur oak	<i>Quercus macrocarpa</i>	Shingle oak	<i>Quercus imbricaria</i>
Chinquapin oak	<i>Quercus muhlenbergii</i>	Shagbark hickory	<i>Carya Ovata</i>
Persimmon	<i>Diospyros virginiana</i>	Mockernut hickory	<i>Carya tomentosa</i>
Post oak	<i>Quercus stellata</i>		

Tree density

In oak savannas, plant trees at the rate of 25 trees per planted acre at no less than 30-foot spacing. Tree cover should be at least 10 percent but no more than 30 percent cover of any field.

Tree layout

If possible plant the trees in clusters or blocks rather than evenly spaced across a field. This will allow for some parts of the savanna to be more open (greater spacing or “openings”) than other parts and create a more natural appearance.

Historically trees in oak savannas were more common on south and west slopes, along ridge lines and knolls, and in protected draws or ravines. Well, drained, shallow soil sites and those with gently rolling topographies that carried fire well, characteristically had more open (wider spacing) tree cover. Tree cover was more closed (closer spacing) on moist, deep soil, highly dissected, or poorly drained sites where fire usually became a less intense or frequent factor.

Use topographic features and soil mapping units to assist in determining where tree cover would be more appropriate.

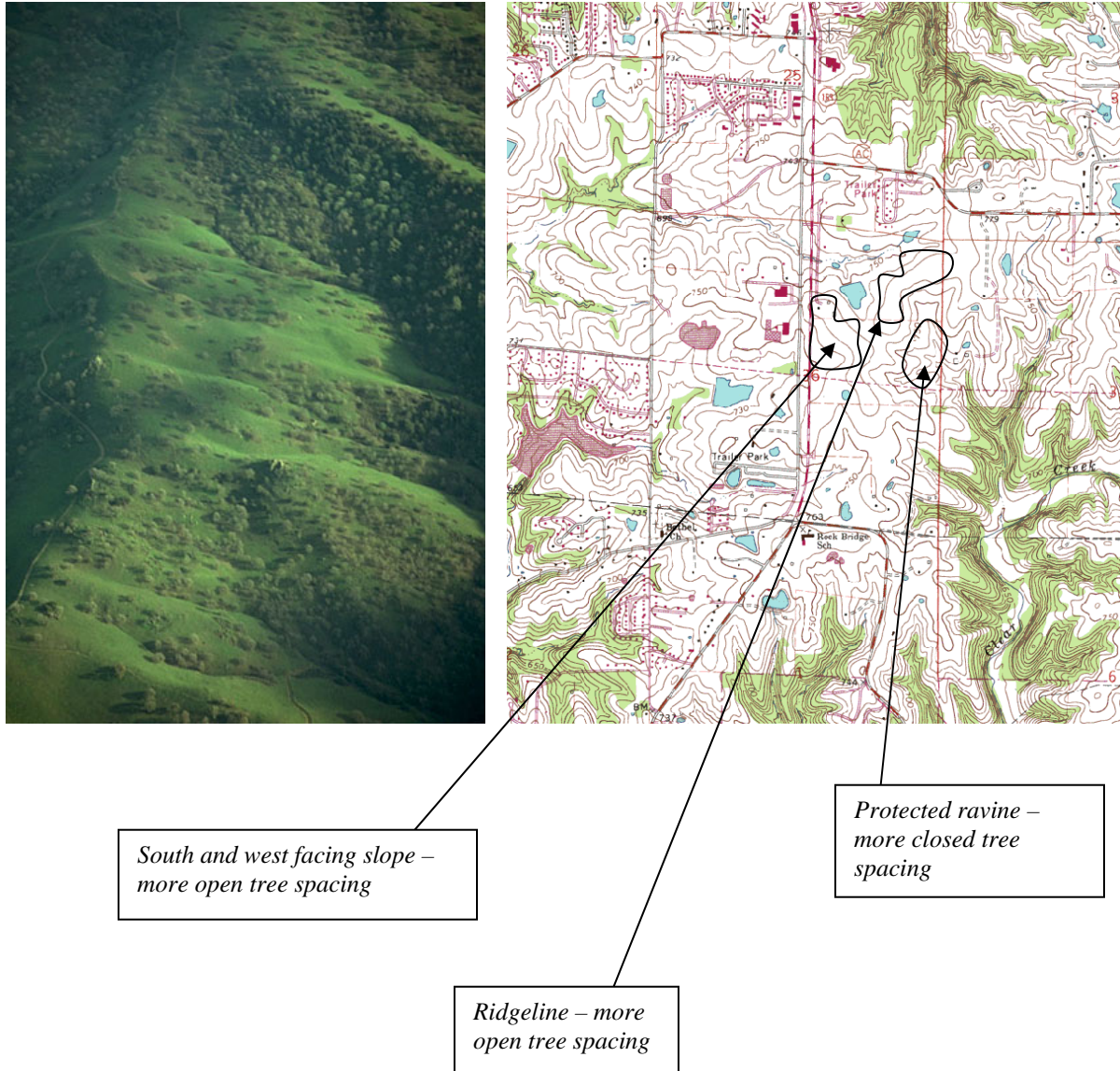


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Suggested Oak Savanna Tree Planting Areas (See savanna design examples on pages 5-6)



Tree Planting Stock

Tree planting stock should be at least 3 feet tall with at least ½ inch caliper. The large initial size is required to facilitate their protection from fire, and reduce competition from grass. It is recommended that container grown air root pruned stock be used because these seedlings have thick fibrous roots as opposed to a large taproot, which may be difficult to plant.

Seedlings should be planted by hand or using an auger. Soil should be firmly packed around seedling roots.

Other important criteria to consider for savanna development and design are planting stock care, planting dates and weed control.



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Understory Planting

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.

Management

At a minimum, vegetation should be controlled in a three-foot wide band around each tree for at least three years with an approved herbicide, weed mat, or tillage.

Fire is essential for the management of savanna communities. Prescribed burning is an essential management practice, but should not be applied to the areas planted in trees until it is determined that the trees have developed sufficient fire resistance. Trees may need to reach 3 to 6 inches diameter at breast height before becoming fire resistant.

For planted habitats prescribed burning should be conducted no earlier than the beginning of the third growing season in areas devoid of trees. Burning in the late fall or winter will encourage the native forbs and reduce damage to trees.

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



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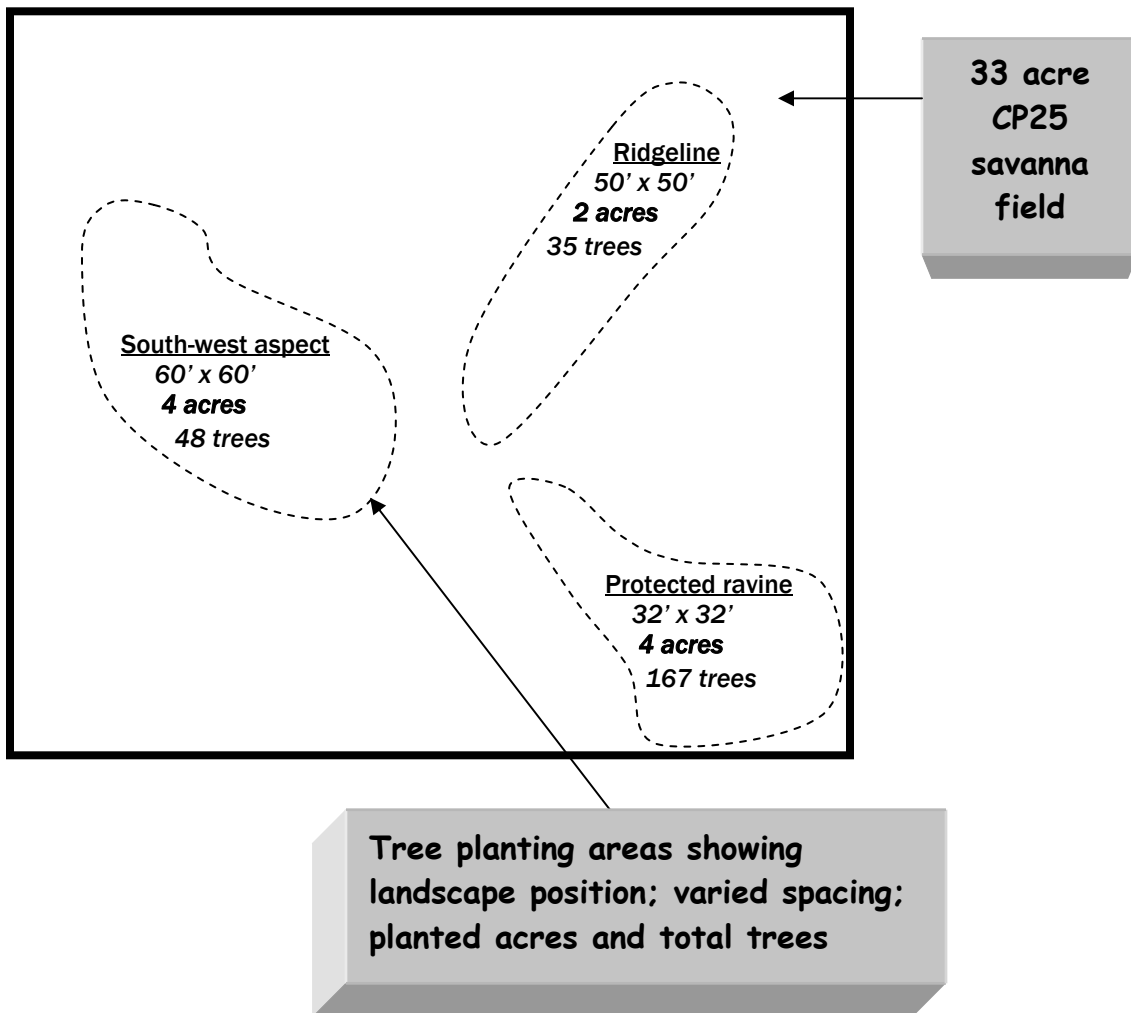
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Savanna Design and Layout Example:

- 33 acre CP25 savanna contract
- landowner desires 30% tree cover (33 acres x 30% = 10 acres of planted trees)
- 643 standard requires 25 trees per planted acre and a tree spacing no closer than 30' x 30'
- 250 total trees required (25 trees/acre x 10 acres = 250 trees)

Suggested Example Design





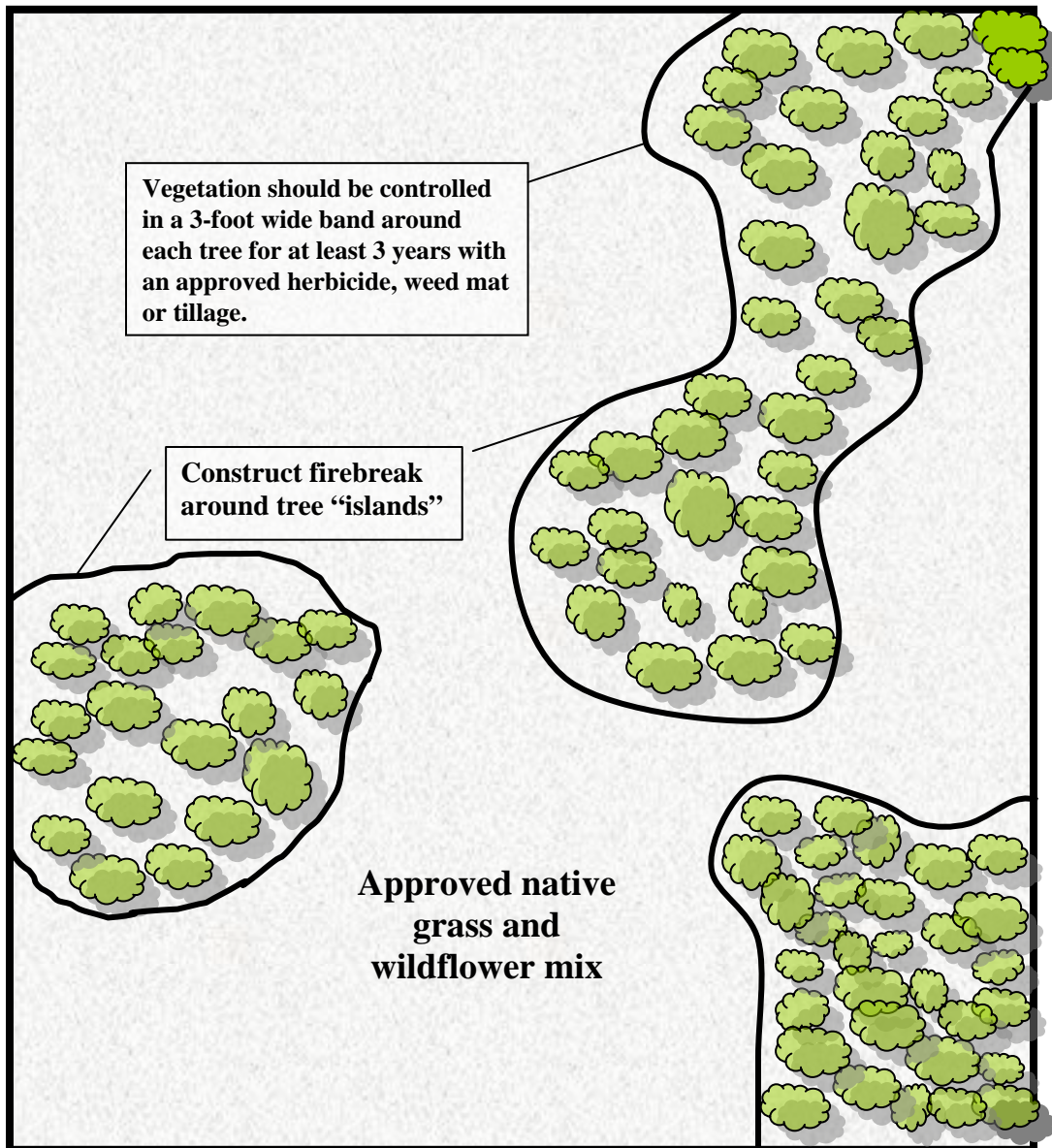
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Savanna Layout Example:

Plant trees in clusters or groups, leaving open contiguous grassland through the field. This will help when conducting a prescribed burn.



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

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



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



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



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

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

G = Glade

A = Annual

B = Biennial