



Glade Information Sheet

Missouri Information Sheet

IS-MO-643Glade

Natural Resources Conservation Service (NRCS)
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Missouri Conservation Practice 643

Restoring and Managing a Glade

What is a Glade?

Glades or barrens are found throughout the Ozarks and occasionally throughout Missouri on steep south and west facing slopes. Glades also occur on hill tops. These are locally known as “Balds”. Glades characteristically have shallow, rocky soils with exposed bedrock and an abundance of wildflowers and native grasses with only a few trees and shrubs. Periodic fires, native herbivores and local conditions of topography, bedrock, and soil greatly influence glade development.

Drought tolerant forbs and grasses are common on glades. A few plant species, such as Missouri bladderpod, glade coneflower and bottlebrush blazing star are restricted to glade communities. A few trees, such as eastern red cedar, and shrubs also occur on glades. Glades support a variety of different wildlife species including tarantula, eastern collard lizard, painted bunting, and prairie warbler. Wild turkey, bobwhite quail and white-tail deer also occur on glades.

Some examples of flowering plants found on glades include pale purple coneflower, yellow coneflower, Missouri primrose, Missouri black-eyed Susan, purple prairie clover, lead plant, lanceleaf coreopsis, scaly blazing star and aromatic aster. Common grasses include sideoats grama, little bluestem, big bluestem, Indian grass, and switchgrass.

Typically glades are surrounded by a savanna or woodland. A savanna is an area of widely scattered trees with a lush understory of native grasses and wildflowers. Post, chinquapin, blackjack, and black oak and shortleaf pine are a few tree species found on upland savannas and woodlands near glades. Trees found near glades are often stunted and express poor development because of shallow droughty soils and poor growing conditions.

Many glades have been degraded by fire suppression, overgrazing, rock quarrying, the spread of undesirable vegetation such as serotia lespedeza, and even plant and rock collectors. These desert-like communities are sensitive to disturbances caused by overgrazing and plant and rock collectors. Improper management or disturbances from rock and plant collectors will quickly erode the thin soils and destroy habitat for reptiles and other animals. Historically, periodic fire kept woody encroachment under control; however, with fire suppression glades and the surrounding woodland communities were engulfed by eastern red cedar and other woody vegetation. Many large “cedar thickets” seen on Ozark hillsides today are actually degraded glade and woodland communities where on small, isolated openings native grasses and wildflowers can still be found.





Different Types of Glades in Missouri

Missouri's glades are classified into several different communities based on bedrock. Limestone, sandstone, igneous, shale, and chert glades occur in Missouri. Limestone glades are the most common and occur throughout the Ozarks; some over 1,000 acres in size. Many limestone glades have been destroyed by rock quarrying and overgrazing. Sandstone glades are common around Stockton, Truman and Pomme De Terre Lakes. Geocarpon (*Geocarpon minimum*) is a state endangered plant that occurs only on sandstone glades. Igneous glades occur in the Saint Francis Mountain region in southeast Missouri. Igneous glades are very resistant to erosion. Shale glades are found in the Lincoln Hills region in northeast Missouri. Chert glades are only found in southwest Missouri in Jasper and Newton Counties. Only about 200 acres of chert glades exist in Missouri.



An igneous glade in Madison County.

Restoring Glades

Glade restoration will only be applied on fields with ecological site map units designated as "glade" that have map units containing a major component tied to a glade ecological site comprising over 50% of the field. Glade restoration often begins with the removal of undesirable woody vegetation – primarily eastern red cedar. Woody vegetation should also be removed from the surrounding savanna or woodland. In some cases undesirable herbaceous vegetation, such as tall fescue or serecia lespedeza, may be present. If possible, spray these areas before cutting down the woody vegetation. Otherwise it will be difficult, if not impossible, to spray the vegetation with all the downed trees. If serecia lespedeza is present, seek professional advice from an NRCS Conservationist or MDC Biologist or Forester for treatment recommendations.



Removing cedars and other woody vegetation is essential to restoring glade complexes.



Brush Management on Glades

Woody vegetation should be removed using a chainsaw. Treat stumps with an approved herbicide to prevent re-sprouting. There is no need to treat the stumps of eastern red cedar. Do not use a bulldozer or tree clipper as heavy machinery will damage exposed bedrock and rocky outcroppings.

Cut woody vegetation should be left to burn or stacked in piles and burned. Because of the extreme volatility of cut cedar, consider leaving the cedar slash for 1 or 2 years before burning, or burn piles when there is snow on the ground or shortly after a rain. A good rule of thumb is to remove all cedar slash within 50 feet of the planned firebreak before conducting a prescribed burn. Piles should not be made near desirable trees that will be retained, otherwise the heat from the burning pile may kill that tree(s). In time, prescribed burning will remove most of the dead woody vegetation. Leave up to 30% desirable woody vegetation on the glade.



The remaining woody vegetation should be widely scattered across the glade, with most trees remaining in draws or near the woodland. The remaining woody vegetation should be made up of eastern red cedar and post, chinquapin, black, or blackjack oak. Other species may also be left to provide greater diversity.

To assist with prescribed burning, a permanent firebreak or service road can be used for a firebreak. The width of a permanent firebreak should be at least 2 times the height of the vegetation to be burned and should also encircle the associated glade. Permanent firebreaks can be constructed using a small dozer or skid-loader. Avoid constructing the firebreak across the glade or along the edge of the glade.



Glades are found along the contour of south and west facing slopes. In this picture, despite little management, glade #1 has remained fairly open and in good condition. Glade #2 is currently being restored by removing woody vegetation and prescribed burning. Notice the permanent firebreak (#3) around glade #2. A large woodland and savanna surrounds glade #2. The permanent firebreak will allow the landowner to burn the entire area as one unit.

Seeding Glades

Reseeding of glades is rarely necessary and only after the need is verified based on an on-site evaluation conducted after prescribed burning has been applied to the site. Consider the site's past uses and history before planning a new seeding or over-seeding. Depending upon the level of restoration required, some sites may only need native forbs or grasses or both native forbs and grasses. Consult with a conservationist to determine if the site should be reseeded. See Table 1 and 2 for approved grasses and forbs. Removing the competing woody vegetation will rejuvenate suppressed native grasses and forbs. Ideally, wait at least until the year after the burn before determining if sufficient forbs and grasses are present. If native forbs and/or grasses are not present or greater plant diversity is the objective seeding will be required.



Seed provided through cost-share, must adhere to the RESTORATION and MANAGEMENT of RARE or DECLINING HABITATS (643) conservation practice which requires plant material selection based on:

1. The use of Missouri Source Identified Class (herbaceous material) – Missouri source is defined as a native plant that source genetically originated in Missouri; was not introduced; and existed within the state borders prior to arrival of settlers. The location of the wild growing parents must be within Missouri and implies that the geographical location is known.
2. All seed from herbaceous material shall comply with Missouri seed laws including Missouri Crop Improvement Association guidance. All seed will comply with AOSCA (Association of Official Seed Certifying Agencies) certification procedures (including appropriate tagging) to include third-party verification by the Missouri Crop Improvement Association of source, genetic identity, and genetic purity of wildland collected or field or nursery grown plant germplasm materials. Seed must be Missouri origin (grown in Missouri) and certified as Missouri Source Identified Class. If Missouri origin (grown) source Identified class seed is not available Missouri source identified class seed may be obtained only from adjoining states.

Source Identified Certification means:

- Parent seed is collected from natural remnant Missouri populations
- No selection, testing, or breeding for specific traits
- Production fields are inspected to verify species, source, and lack of noxious weeds.
- Seed is certified for purity and germination.

Improved varieties or cultivars shall not be used for glade restoration projects.

Conservation of the monarch butterfly is critically important as it represents other pollinators and is experiencing precipitous declines, therefore, it is recommended that at least 1 species of approved milkweed (*Asclepias* spp.) is included in the seed mix (see Table 2). Also see the **Monarch Habitat Information Sheet (IS-MO643Monarch) for more specific information related to the monarch.** The forb mixture will be seeded at a minimum of 3.0 pounds PLS per acre for glade restoration and comprised of at least 9 species with no single species exceeding 15 percent of the total mixture. Annuals and biennials combined also should not exceed 10 percent of the mixture. A minimum of three flowering species will be included for each season (spring, summer, and fall) for native pollinator plantings (see the Native Forb Information Sheet [IS-MO643Forbs] on the Missouri NRCS e-FOTG site at



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<http://efotg.sc.egov.usda.gov/treemenuFS.aspx> under Section IV, Upland Wildlife Habitat Management (645) standard). This helps ensure a nice diversity, and that the stand will be dominated by perennials, which will persist over time. Refer to Table 1 for information (flower color, blooming time, and wildlife value) to aid you in your choices.

Glades will be planted with little bluestem at 1.2# PLS/acre, plus either sideoats grama or broomsedge at 1.4# PLS/acre. All other grasses will be limited to no more than 0.4# PLS/acre. See Table 1 for approved grasses.

If possible conduct a prescribed burn in the fall or winter before overseeding native grasses and/or forbs. Native grasses and forbs should be dormant seeded (November through February). Seed can be broadcasted using light equipment, such as an ATV spreader, or by hand. If broadcasting seed by hand, mix the seed with an inert carrier (1:3 ratio) such as saw dust or moist sand and spread the mix using a crisscross pattern across the glade to evenly distribute the seed over the entire area.

Long-Term Management Recommendations

Prescribed fire is essential to maintaining a glade. Without it, woody vegetation will overtake the area. Prescribed burns should be conducted on a 3 to 5 year rotation, preferably sometime between November and February. A conservationist may recommend more frequent burning to control invading woody vegetation or burning at another time of the year. Because of the steep terrain, and difficulty in constructing firebreaks, the entire glade and woodland can be burned as one unit.



A large restored glade and savanna complex in southwest Missouri.

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

Photos courtesy of the Missouri Department of Conservation. 2004.

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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



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 *
Yarrow	<i>Achillea millefolium</i>	MP
Leadplant	<i>Amorpha canescens</i>	S, DP, MP, G
Meadow anemone	<i>Anemone canadensis</i>	WP
Marsh milkweed	<i>Asclepias incarnata</i>	WP
Purple milkweed	<i>Asclepias purpurascens</i>	S, DP, MP
Common milkweed	<i>Asclepias syriaca</i>	DP, MP, WP
Butterfly milkweed	<i>Asclepias tuberosa</i>	S, DP, MP, G
Whorled milkweed	<i>Asclepias verticillata</i>	S, DP, MP, G
Spider milkweed	<i>Asclepias viridis</i>	DP, MP
Fascicled false foxglove	<i>Agalinas fasciculata</i>	DP, MP
Sky blue aster	<i>Symphyotrichum azureus</i>	S, DP
Smooth aster	<i>Symphyotrichum laevis</i>	S
New England aster	<i>Symphyotrichum novae-angliae</i>	WP
Aromatic aster	<i>Symphyotrichum oblongifolius</i>	DP, MP, G
Purple daisy aster	<i>Symphyotrichum patens</i>	
Willow aster	<i>Symphyotrichum praealtus</i>	WP
Silky aster	<i>Symphyotrichum sericeus</i>	DP, G
Canada milk vetch	<i>Astragalus Canadensis</i>	MP
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
Tickseed Sunflower	<i>Bidens aristosa</i>	MP
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
Wild hyacinth	<i>Camassia scilloides</i>	S, DP, MP, G
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
Sensitive Pea	<i>Chamaecrista nititans</i>	S
Grandiflora coreopsis	<i>Coreopsis grandiflora</i>	DP, MP
Lanceleaf 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



Common Name	Scientific Name	Habitat Type *
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
Rose verbena	<i>Glandularia canadensis</i>	S, DP, G
Curly cup gum plant	<i>Grindelia lanceolata</i>	S, DP, MP, G
Large-flowered Gaura	<i>Gaura longiflora</i>	DP, MP, WP, S
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
Willowleaf Sunflower	<i>Helianthus salicifolius</i>	WP, MP, DP
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, MP, 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
Postrate lespedeza	<i>Lespedeza procumbens</i>	DP, G
Slender lespedeza	<i>Lespedeza virginica</i>	S, DP, MP, G
Violet lespedeza	<i>Lespedeza violacea</i>	S
Rough blazing star	<i>Liatris aspera</i>	S, DP, G
Glade/Bottlebrush blazing star	<i>Liatris mucronata</i>	S, DP, G
Blazing star	<i>Liatris pycnostachya</i>	DP, MP, WP, G
Eastern Blazing Star	<i>Liatris scariosa</i>	S, DP, MP
Squarrosa blazing star	<i>Liatris squarrosa</i>	S, DP
Squarrulosa blazing star	<i>Liatris squarrulosa</i>	S, DP, MP, G
Yellow flax	<i>Linum medium</i>	DP, MP
Cardinal flower	<i>Lobelia cardinalis</i>	WP
Blue lobelia	<i>Lobelia siphilitica</i>	WP
Seed box	<i>Ludwigia alternifolia</i>	WP
Barbara's button	<i>Marshallia caespitosa</i>	DP, MP, WP
Bunchflower	<i>Melanthium virginicum</i>	MP, WP, S (Wet)
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
Evening primrose	<i>Oenothera biennis</i>	MP
Missouri primrose	<i>Oenothera missouriensis</i>	DP, G



Common Name	Scientific Name	Habitat Type *
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>	S, 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 tubaeflorus</i>	S, DP, MP
Narrow-leaved false dragonhead	<i>Physostegia angustifolia</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>Psoralegium tenuiflorum</i>	DP, MP, WP, G
Hairy Mountain Mint	<i>Pycnanthemum pilosum</i>	S, DP, MP, WP, G
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
Pasture rose	<i>Rosa carolina</i>	DP, MP, S
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>	S, WP
Wild petunia	<i>Ruellia humilis</i>	DP, MP, G
Pitchers sage	<i>Salvia azurea</i>	DP, MP, G
Downy skullcap	<i>Scutellaria incana</i>	S (S. MO), MP
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
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
White upland aster	<i>Solidago ptarmicoides</i>	S, MP, DP, G
Riddell's goldenrod	<i>Oligoneuron riddellii</i>	WP
Rigid/Stiff goldenrod	<i>Oligoneuron rigida</i>	S, DP, MP, WP, G
Showy goldenrod	<i>Solidago speciosa</i>	S, DP, MP
Bean, Small Fuzzy	<i>Strophostyles leiosperma</i>	DP, MP, S
Goat's rue	<i>Tephrosia virginiana</i>	S, DP, MP, G
Ohio spiderwort	<i>Tradescantia ohioensis</i>	S, DP, MP, WP
Blue vervain	<i>Verbena hastata</i>	WP



Common Name	Scientific Name	Habitat Type *
Hoary vervain	<i>Verbena stricta</i>	DP, MP
Yellow ironweed	<i>Verbesina alternifolia</i>	S, BF, WP
Wingstem sunflower	<i>Verbesina helianthoides</i>	S, DP, MP
White wingstem	<i>Verbesina virginica</i>	S, BF
Ironweed	<i>Vernonia missurica</i>	MP, WP
Giant ironweed	<i>Vernonia gigantean</i>	S (Wet), 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, BF = Bottomland Forest