

Ecological Site Description

Sandstone/Shale Upland Prairie

R116BY023MO

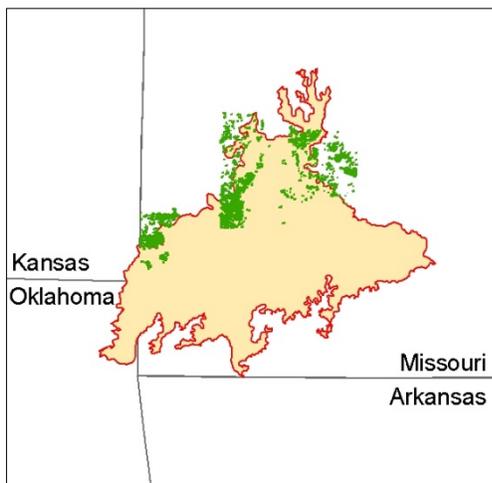
- (*Amorpha canescens*/*Schizachyrium scoparium* - *Andropogon gerardii*)
- (leadplant/little bluestem – big bluestem)

An Ecological Site Description (ESD) is a reference document of ecological knowledge regarding a particular land area (ecological site). An ESD describes ecological potential and ecosystem dynamics of land areas and their potential management. Ecological sites are linked to soil survey map unit components, which allows for mapping of ecological sites. (**NOTE:** *This is a “provisional” ESD, and is subject to change. It contains basic ecological information sufficient for conservation planning and land management in Missouri. After additional information is developed and reviewed, a “Correlated” ESD will be published and will be available via the Web Soil Survey <http://websoilsurvey.nrcs.usda.gov> .)*

Major Land Resource Area: 116B – Springfield Plain

Introduction

The Springfield Plain (area outlined in red on the map) is in the western part of the Ozark Uplift. It is primarily a smooth plateau with some dissection along streams. Elevation is about 1,000 feet in the north to over 1,700 feet in the east along the Burlington Escarpment adjacent to the Ozark Highlands. The underlying bedrock is mainly Mississippian-aged limestone, with areas of shale on lower slopes and structural benches, and intermittent Pennsylvanian-aged sandstone deposits on the plateau surface.



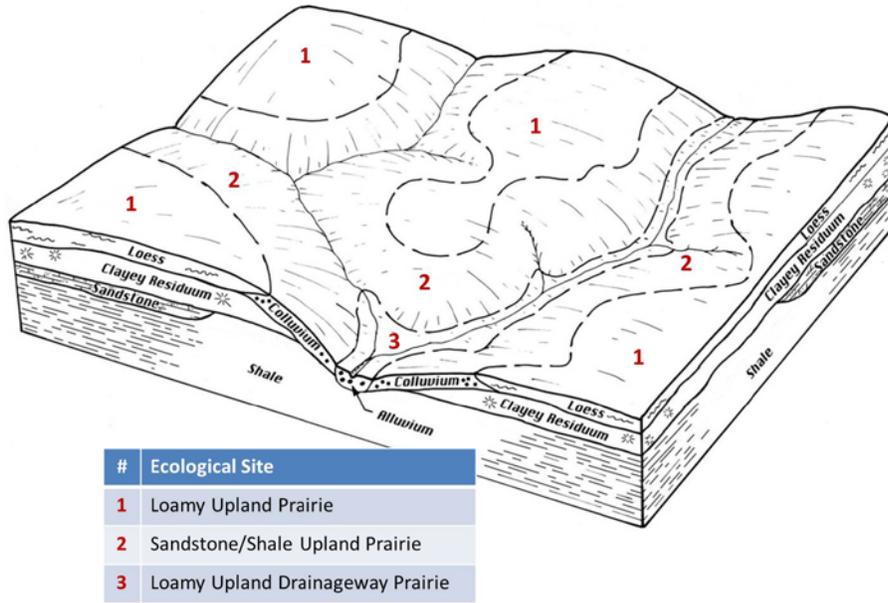
Sandstone/Shale Upland Prairies (green areas on the map) occur on gently rolling to moderately steep areas where mixed sandstone and shale deposits are near the surface, particularly around the lower James River in Jasper County to the west and along tributaries of the Sac River

to the north. Soils are deep to stratified sandstone and shale bedrock.

Physiographic Features

This site is on summit crests, shoulders, and upper backslopes, with slopes of 1 to 15 percent. The site generates runoff to adjacent, downslope ecological sites. This site does not flood.

The following figure (adapted from Peer, 2004) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. It is within the area labeled “2” on the figure, shown here on shoulders and upper backslopes. Loamy Upland Prairie sites, labeled “1”, are upslope on summits that have more loess and residuum over the underlying sandstone and shale.



#	Ecological Site
1	Loamy Upland Prairie
2	Sandstone/Shale Upland Prairie
3	Loamy Upland Drainageway Prairie

Soil Features

These soils are underlain with sandstone or shale bedrock at depths below 40 inches, to greater than 60 inches. The soils were formed under prairie vegetation, and have dark, organic-rich surface horizons. Parent material is slope alluvium over residuum derived from sandstone and/or shale. Some soils have a surface layer of loess. They have silt loam, gravelly silt loam or very gravelly silt loam

surface layers, and loamy or clayey subsoils that are gravelly to very gravelly in some soils. These soils are not affected by seasonal wetness. Soil series associated with this site include Barden, Goodson, and Sylvania.

Ecological Dynamics

Information contained in this section was developed using historical data, professional experience, field reviews, and scientific studies. The information presented is representative of very complex vegetation communities. Key indicator plants, animals and ecological processes are described to help inform land management decisions. Plant communities will differ across the MLRA because of the naturally occurring variability in weather, soils, and aspect. The Reference Plant Community is not necessarily the management goal. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

The reference Sandstone/Shale Upland Prairie site was dominated by little bluestem, big bluestem, Indian grass and switch grass along with many secondary grasses such as tall dropseed, and assorted panicums. Numerous forbs also prevailed on this site. Common forbs included rosinweed, sunflowers, and lespedeza along with low growing shrubs such as leadplant and New Jersey tea. Occasional, widely scattered open-grown oaks and hickories also were present interspersed throughout this site.

With little to interrupt fire, this ecological site burned every 1 to 3 years. Fire removed dead plant litter and provided room for a lush growth of prairie vegetation. Fire also kept woody species at bay. Grazing by native large herbivores such as bison and elk also impacted these sites. Their activities altered composition and structure of the vegetation. Fuel loads would have been altered by heavy grazing and regular fire behavior, providing for a diversity of structure and composition. The partially wooded draws would have burned less intensely and less frequently. During fire free intervals woody species would have increased in abundance and spread out onto the prairie to add to existing scattered savanna trees.

Today, Sandstone/Shale Upland Prairies are rare and scattered in the region, as the former prairies and open savannas have been converted to pasture or cropland. The known remnants are degraded by fire suppression and uncontrolled grazing by domestic livestock. Continuous heavy grazing by livestock during the growing season will impact the vegetation composition. Continuous heavy grazing decreases vigor of the more palatable plants and generally encourages a gradual increase in secondary plants such as tall dropseed, purpletop, and sideoats grama.

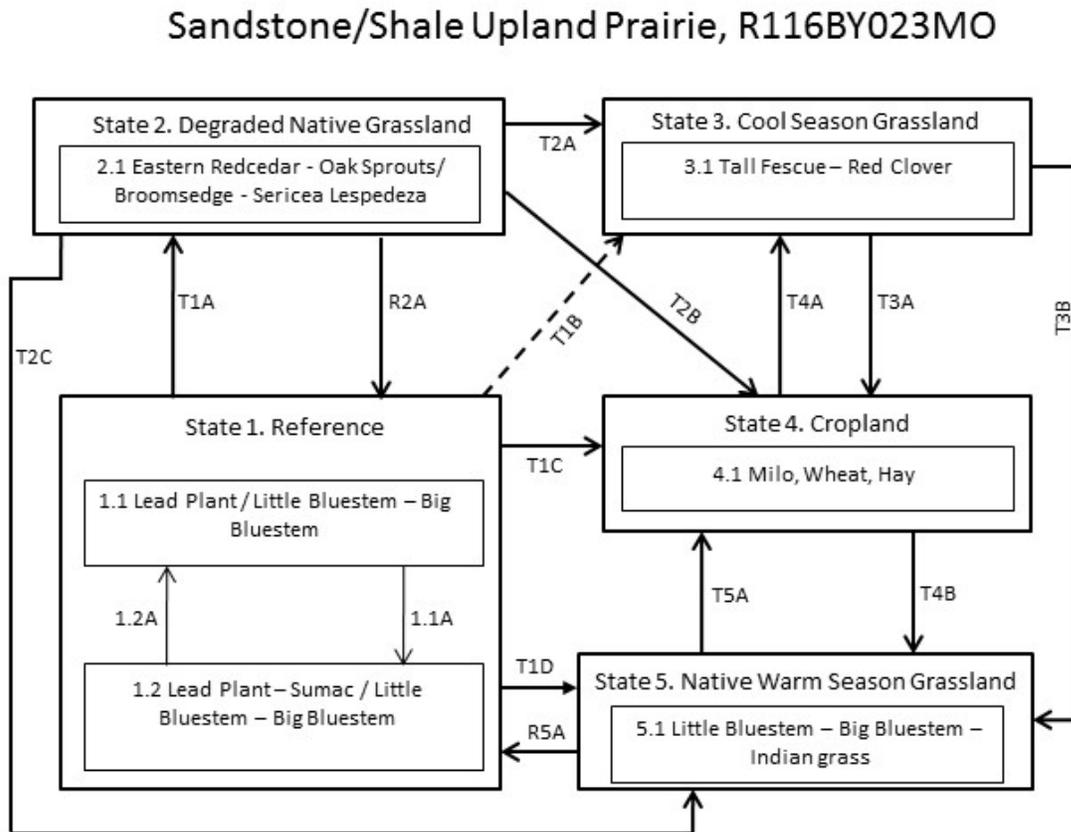
Many of the forbs are very palatable and readily grazed by livestock. These palatable forbs decrease with even moderate continuous grazing, but composition can be maintained using prescribed grazing. Forbs that increase include heathaster, tall goldenrod, Missouri goldenrod, western ragweed and Louisiana sagewort. Woody plants such as buckbrush, blackberry and sumac also increase with continuous overgrazing and the the absence of fire on site.

The absence of both grazing and fire will encourage a gradual increase of mulch and litter. Heavy accumulations of mulch and litter will negatively affect vegetation growth. Herbage production will be reduced. Bunchgrasses, especially little bluestem, are usually reduced. Heavy mulch accumulation also accommodates the encroachment of woody plant species such as buckbrush, blackberry, roughleaf dogwood, sumac, elm, persimmon, hawthorn and hackberry.

However, when properly managed, including the reintroduction of fire, existing remnants of Sandstone/Shale Upland Prairies show great resiliency and the stand composition can be improved and maintained indefinitely.

A State and Transition Diagram is depicted in Figure 1. Detailed descriptions of each state, transition, plant community, and pathway follow the model. This model is based on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.

Figure 1: State and transition diagram



Code	Event/Activity/Process
T1A	Fire suppression > 10 years; woody invasion; domestic grazing
T1B	Tillage; vegetative seeding; grassland management
T1C, T3A, T5A	Tillage; conservation cropping system
T1D	Prescribed grazing; prescribed fire
T2A	Woody removal; tillage; vegetative seeding; grassland management
T2B	Woody removal; tillage; conservation cropping system
T2C	Woody removal; grassland management; prescribed fire
T4A	Vegetative seeding ; grassland management
T3B, T4B	Vegetative seeding; prescribed fire; grassland management
1.1A	Fire-free interval 5-10 years
1.2A	Fire interval 1-3 years
R2A	Woody removal; prescribed fire 1-3 years
R5A	Vegetative seeding; prescribed fire 1-3 years

Ecological States

State 1: Reference

This State is native prairie dominated by big bluestem, little bluestem and forbs, along with numerous shrubs and occasional, widely scattered, stunted trees such as post oak and hickory. Two phases can occur that will transition back and forth depending on fire frequencies. Longer fire free intervals will allow woody species to increase such as sumac. When fire intervals shorten these woody species will decrease.

This undisturbed State is uncommon but some good examples still exist. Most sites, however, have been converted to cool season grasslands, cropland, or degraded by domestic grazing.

State 2: Degraded Native Grassland

Reference states that have experienced fire suppression for 10 or more years and heavy domestic grazing will transition to this state. With fire suppression, woody species such as post oak and eastern redcedar will begin to increase transitioning this state from a prairie to a woody invaded state. Native ground cover will also decrease and invasive species such as tall fescue, broomsedge and sericea lespedeza may begin to dominate. Transition to cool season grasslands (State 3) or cropland (State 4) is very common. Transition back to a reference state may be difficult if fire suppression and other disturbances have been long term. It may be easier to move to a re-established native warm season grassland (State 5) and then over time back to a reference state.

State 3: Cool Season Grassland

Conversion of other states to non-native cool season species such as tall fescue and red clover has been common in this area. Occasionally, these pastures will have a few scattered oaks and eastern redcedar. Long term uncontrolled grazing can cause significant soil erosion and compaction. A return to the Reference State may require a very long series of management options.

State 4: Cropland

This is a common state that currently exists in the region with milo, wheat, and hay land production occurring. Some conversion to cool season grassland occurs for a limited period of time before transitioning back to cropland. Limited acres are sometimes converted to native warm season grassland.

State 5: Native Warm Season Grassland

Conversion from Cool Season Grassland (State 3) or the Cropland (State 4) to this State is increasing due to renewed interest in warm season grasses as a supplement to cool season grazing systems or as a native restoration activity. This State, once established, can be transformed back to a Reference State. Substantial restoration time and management inputs will be needed.

Reference State Plant Community

Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
POST OAK	<i>Quercus stellata</i>	0-5	50
BLACK HICKORY	<i>Carya texana</i>	0-5	40

Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
SMOOTH SUMAC	<i>Rhus glabra</i>	5-10	3
LEAD PLANT	<i>Amorpha canescens</i>	5-20	4
NEW JERSEY TEA	<i>Ceanothus americanus</i>	5-10	3
WILD PLUM	<i>Prunus americana</i>	5-10	10
PASTURE ROSE	<i>Rosa carolina</i>	5-10	2

Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
LITTLE BLUESTEM	<i>Schizachyrium scoparium</i>	30-40
VIRGINIA WILDRYE	<i>Elymus virginicus</i>	10-20
BIG BLUESTEM	<i>Andropogon gerardii</i>	20-30
INDIAN GRASS	<i>Sorghastrum nutans</i>	10-20
SIDEOATS GRAMA	<i>Bouteloua curtipendula</i>	10-20
EASTERN GAMAGRASS	<i>Tripsacum dactyloides</i>	5-10
TALL DROPSEED	<i>Sporobolus asper</i>	5-10
POVERTY OATGRASS	<i>Danthonia spicata</i>	5-10
WOOLY PANICGRASS	<i>Dichanthelium acuminatum</i>	5-10
SWITCHGRASS	<i>Panicum virgatum</i>	5-10

Forbs

Common Name	Botanical Name	Cover % (low-high)
ELM LEAF GOLDENROD	<i>Solidago ulmifolia</i>	1-10
BRISTLY SUNFLOWER	<i>Helianthus hirsutus</i>	1-10
MILK VETCH	<i>Astragalus distortus</i>	1-10
BLAZING STAR	<i>Liatris aspera</i>	1-10
WHITE PRAIRIE CLOVER	<i>Dalea candida</i>	1-10
NARROW-LEAVED BLUETS	<i>Hedotis nigricans</i>	1-10
AROMATIC ASTER	<i>Symphotrichum oblongifolium</i>	1-10
GOAT'S RUE	<i>Tephrosia virginiana</i>	1-10
FRINGELEAF WILD PETUNIA	<i>Ruellia humilis</i>	1-10
ILLINOIS BUNDLE FLOWER	<i>Desmanthus illinoensis</i>	1-10
ROUNDHEAD LESPEDEZA	<i>Lespedeza capitata</i>	1-10
MISSOURI GOLDENROD	<i>Solidago missouriensis</i>	1-10
PALE CONEFLOWER	<i>Echinacea pallida</i>	1-10
SCURF PEA	<i>Psoralidium tenuiflorum</i>	1-10
CREAM WHITE INDIGO	<i>Baptisia bracteata</i>	1-10
PURPLE MILKWORT	<i>Polygala sanguinea</i>	1-10
BLUE HEARTS	<i>Buchnera americana</i>	1-10
BIG FLOWER COREOPSIS	<i>Coreopsis grandiflora</i>	1-10
PRAIRIE PHLOX	<i>Phlox andicola</i>	1-10
PRAIRIE VIOLET	<i>Viola pedatifida</i>	1-10
WILLOW-LEAVED ASTER	<i>Symphotrichum praealtum</i>	1-10
ASHY SUNFLOWER	<i>Helianthus mollis</i>	1-10
ARROWLEAF VIOLET	<i>Viola sagittata</i>	1-10

Supporting Information

Wildlife*

- Game species that utilize this ecological site include:

Northern Bobwhite will utilize this ecological site for food (seeds, insects) and cover needs (escape, nesting and roosting cover).

Cottontail rabbits will utilize this ecological site for food (seeds, soft mast) and cover needs.

Turkey will utilize this ecological site for food (seeds, green browse, soft mast, insects) and nesting and brood-rearing cover. Turkey poults feed heavily on insects provided by this site type.

White-tailed Deer will utilize this ecological site for browse (plant leaves in the growing season, seeds and soft mast in the fall/winter). This site type also can provide escape cover.

- Bird species associated with this ecological site reference state condition:
Breeding birds as related to vegetation structure (related to time since fire, grazing, haying, and mowing):

Vegetation Height Short (< 0.5 meter, low litter levels, bare ground visible):

Grasshopper Sparrow, Horned Lark, Upland Sandpiper, Greater Prairie Chicken, Northern Bobwhite

Vegetation Height Moderate (0.5 – 1 meter, moderate litter levels, some bare ground visible):

Eastern Meadowlark, Dickcissel, Field Sparrow, Upland Sandpiper, Greater Prairie Chicken, Northern Bobwhite, Blue Grosbeak, Scissor-Tailed Flycatcher, Eastern Kingbird, Lark Sparrow

Tall Vegetation Height (> 1 meter, moderate-high litter levels, little bare ground visible):

Henslow's Sparrow, Dickcissel, Greater Prairie Chicken, Field Sparrow, Northern Bobwhite, Sedge Wren, Northern Harrier

Brushy – Mix of grasses, forbs, native shrubs (e.g., *Rhus copallina*, *Prunus americana*), native vines (*Rubus* spp., *Rosa carolina*) and small trees (e.g., *Cornus racemosa*):

Bell's Vireo, Yellow-Breasted Chat, Loggerhead Shrike, Brown Thrasher, Common Yellowthroat

Winter Resident: Short-Eared Owl, Northern Harrier, Le Conte's Sparrow, Savannah Sparrow

- Amphibian and reptile species associated with this ecological site reference state condition:
Ornate Box Turtle (*Terrapene ornata ornata*), Western Slender Glass Lizard (*Ophisaurus attenuatus attenuatus*), Prairie Ring-necked Snake (*Diadophis punctatus arnyi*), Prairie Kingsnake (*Lampropeltis calligaster calligaster*), Great Plains Skink (*Eumeces obsoletus*), Southern Prairie Skink (*E. septentrionalis obtusirostris*), and Bullsnake (*Pituophis catenifer sayi*).

Prairies with ephemeral vernal fishless wetlands: Western Chorus Frog (*Pseudacris triseriata triseriata*), Southern Leopard Frog (*Rana sphenoccephala*), and Eastern Tiger Salamander (*Ambystoma tigrinum*).

- Small mammals associated with this ecological site reference state condition: Least Shrew (*Cryptotis parva*), Prairie Vole (*Microtus ochrogaster*), Plains Pocket Gopher (*Geomys bursarius*), Meadow Jumping Mouse (*Zapus hudsonius*), and Badger (*Taxidea taxus*).
- Many native insect species are likely associated with this ecological site, especially native bees, ants, beetles, butterflies and moths, and crickets, grasshoppers and katydids. However information on these groups is often lacking enough resolution to assign them to individual ecological sites.

Insect species known to be associated with this ecological site's reference state condition: Regal Fritillary butterfly (*Speyeria idalia*) whose larvae feed primarily on native prairie violets (*Viola pedata*, *V. pedatifida*, and *V. sagittata*); Mottled Dusky Wing butterfly (*Erynnis martialis*), Ottoe Skipper butterfly (*Hesperia ottoe*), Arogos Skipper butterfly (*Atrytone arogos iowa*), Golden Byssus butterfly (*Problema byssus kumskaka*), Delaware Skipper butterfly (*Atrytone logan logan*), and Crossline Skipper butterfly (*Polites origenes*). The larvae of the moth *Eucosma bipunctella* bore into compass plant (*Silphium laciniatum*) roots and feed and the larvae of the moth *Eucosma giganteana* bore into a number of *Silphium* species roots and feed. Native bees, important pollinators, that may be associated with this ecological site's reference condition include: *Colletes brevicornis*, *Andrena beameri*, *A. helianthiformis*, *Protandrena rudbeckiae*, *Halictus parallelus*, *Lasioglossum albipennis*, *L. coreopsis*, *L. disparilis*, *L. nymphaeum*, *Ashmeadiella buconis*, *Megachile addenda*, *Anthidium psoraleae*, *Eucera hamata*, *Melissodes coloradensis*, *M. coreopsis*, and *M. vernoniae*. The Short-winged Katydid (*Amblycorypha parvipennis*), Prairie Mole Cricket (*Gryllotalpa major*), Green Grasshopper (*Hesperotettix speciosus*) and Two-voiced Conehead katydid (*Neoconcephalus bivocatus*) are possible orthopteran associates of this ecological site. A number of leaf beetle species (*Anisostena funesta*, *Chaetocnema fuscata* and *Cryptocephalus striatulus*) may utilize this ecological site.

*This section prepared by Mike Leahy, Natural Areas Coordinator, Missouri Department of Conservation, 2013

Forestry

- **Management:** **This ecological site is not recommended for traditional timber management activity.** Historically this site was dominated by a ground cover of native prairie grasses and forbs. Some scattered open grown trees may have also been present. May be suitable for non-traditional forestry uses such as windbreaks, environmental plantings, alley cropping (a method of planting, in which rows of trees or shrubs are interspersed with rows of crops) or woody bio-fuels.

Glossary

Backslope – a hillslope profile position that forms the steepest and generally linear, middle portion of the slope.

Backswamp – marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces

Calcareous – the presence of calcium carbonate in the soil parent material within the rooting zone; relatively alkaline

Claypan – a dense, compact, slowly permeable layer in the subsoil having much higher clay content than the overlying material

Chert – hard, extremely dense or compact crystalline sedimentary rock, consisting dominantly of interlocking crystals of quartz

Cliff – a significant vertical, or near vertical, rock exposure

Dolomite – a type of sedimentary rock that is a carbonate mineral composed of calcium magnesium carbonate

Drainageway – the upper most reach of a stream channel system characterized by little meandering

Dry – a site where soil moisture is limiting during the growing season; low available water capacity

Dune – a low mound, ridge, bank or hill of loose, wind-blown sand

Exposed – steep, south and west-facing slopes, which are warmer and drier than other slope aspects

Flatwoods – a type of woodland that occurs on soils with a root restricting subsoil layer within 20 to 30 inches, resulting in very slow runoff and ponding that remains saturated for most of the winter and early spring months but dries out and becomes very dry in the summer months; plants that grow there must be adapted to both conditions

Floodplain – the nearly level plain that borders a stream and is subject to inundation under flood-stage conditions

Footslope – a hillslope position at the base of a slope where hillslope sediment (colluvium) accumulates

Forest – a vegetative community dominated by trees forming a closed canopy and interspersed with shade-tolerant understory species

Fragipan – a dense, brittle subsoil horizon that is extremely hard and compact when dry

Glade – open, rocky, barren vegetative community dominated by drought-adapted forbs and grasses, typically with scattered, stunted woody plants

Igneous –bedrock formed by cooling and solidification of magma. Granite and rhyolite are typical igneous bedrocks in Missouri

Limestone – a type of sedimentary rock composed largely of calcium carbonate

Loess – material transported and deposited by wind and consisting predominantly of silt-size particles

Loamy – soil material containing a relatively equal mixture of sand and silt and a somewhat smaller proportion of clay

Marsh – a type of wetland that is dominated by herbaceous rather than woody plant species

Moist – a site that is moderately well to well drained and has high available water capacity, resulting in a well-balanced supply of moisture (neither too dry nor too wet).

Mudstone – blocky or massive, fine-grained sedimentary rock in which the proportions of clay and silt are approximately equal

Natric – a soil horizon that displays a blocky, columnar, or prismatic structure and has a subhorizon with an exchangeable-sodium saturation of over 15%

Outwash – stratified sediments of sand and gravel removed or “washed out” from a glacier by melt-water streams

Prairie – a vegetative community dominated by perennial grasses and forbs with scattered shrubs and very few trees

Protected – steep, north- and east-facing slopes, which are cooler and moister than other slope aspects

Residuum - unconsolidated, weathered, or partly weathered mineral material that accumulates by disintegration of bedrock in place

Riser – a component of terraces and flood-plain steps consisting of the steep side slope; the escarpment

Riverfront – a vegetative community in the floodplain immediately adjacent and generally parallel to a river or stream channel

River hills – a geographic area characterized by thick, dissected loess deposits, formed immediately adjacent to the edges of the Missouri and Mississippi River floodplains

Sandy – a coarse-sized soil containing a large mixture of sand and gravels and a somewhat smaller proportion of silts and clays with excessive drainage

Sandstone – a sedimentary rock containing dominantly sand-size particles

Savanna – grasslands interspersed with open-grown scattered trees, groupings of trees, and shrubs

Shale – a sedimentary rock formed from clay, silty clay, or silty clay loam deposits and having the tendency to split into thin layers

Shallow – a site with bedrock within 20 inches of the surface

Shoulder – the slope profile position that forms the convex surface near the top of a hill slope; it comprises the transition zone from summit to backslope

Sinkhole – a closed, circular or elliptical depression, commonly funnel-shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock or by collapse of underlying caves within bedrock

Summit – the top or highest area of a hillslope

Swale –shallow, closed depressions irregularly spaced across a floodplain or terrace with an irregularly undulating surface.

Swamp – an area of low, saturated ground, intermittently or permanently covered with water, and predominantly vegetated by shrubs and trees.

Talus – rock fragments of any size or shape (usually coarse and angular) derived from and lying at the base of a cliff or very steep rock slope.

Terrace – a step-like surface, bordering a valley floor that represents the former position of a flood plain

Till – dominantly unsorted and unstratified soil material deposited directly by a glacier

Upland – a general term for the higher ground of a region, in contrast with a low-lying, adjacent land such as a valley or floodplain

Wet – a somewhat poorly, poorly or very poorly drained site that has an oversupply of moisture during the growing season

Woodland – a highly variable vegetative community with a canopy of trees ranging from 30 to 100 percent closure with a sparse midstory and a dense ground flora of grasses, sedges and forbs

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