

Ecological Site Description

Loamy Upland Drainageway Savanna

R109XY028MO

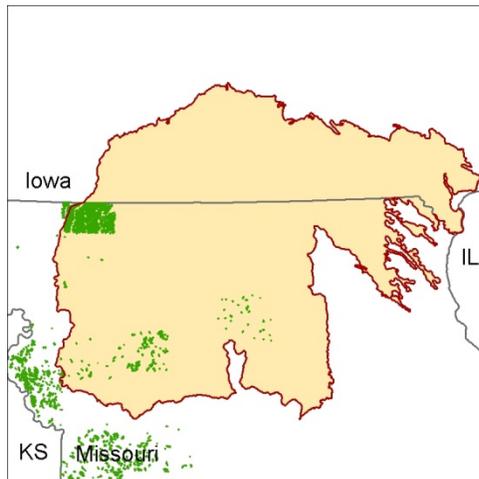
- (*Quercus macrocarpa*/*Salix humilis*/*Andropogon gerardii* - *Tripsacum dactyloides*)
- (bur oak/prairie willow/big bluestem – Eastern gamagrass)

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: 109 – Iowa and Missouri Heavy Till Plain

Introduction

The Iowa and Missouri Heavy Till Plain (area outlined in red on the map) is an area of rolling hills interspersed with interfluvial divides and alluvial valleys. Elevation ranges from about 660 feet along the lower reaches of rivers, to about 980 feet on stable interfluvial summits in southern Iowa. Relief



is about 80 to 160 feet between major streams and adjacent interfluvial summits. Most of the till plain drains south to the Missouri River via the Grand and Chariton River systems, but the northeastern portion drains southeast to the Mississippi River. Loess caps the pre-Illinoian aged till on interfluvial divides, whereas the till is exposed on side slopes. Mississippian aged limestone and Pennsylvanian aged sandstone and shale crop out on lower slopes in some areas.

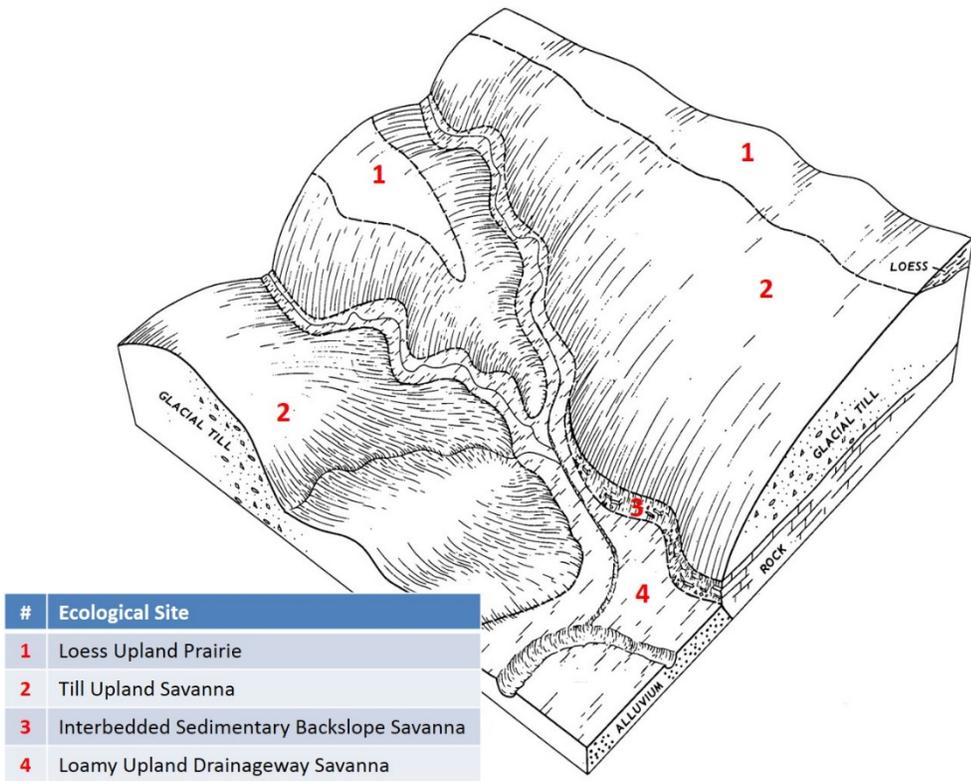
Loamy Upland Drainageway Savannas are within the green areas on the map. These sites are scattered in small delineations in the upland portions of the MLRA, particularly in the west and in adjacent areas to the southwest. They are associated with Floodplain Woodland and Wet Floodplain Prairie sites downstream, and with adjacent upland ecological sites. Soils are loamy, and are subject to flooding.

Physiographic Features

This site is in narrow drainageways in the uplands, with slopes of 1 to 5 percent. The site receives runoff from adjacent upland sites. Most areas are subject to frequent, brief flooding.

The following figure (adapted from Jeffrey, 1974) shows the typical landscape position of this ecological site, and landscape relationships among the major ecological sites of the uplands. The site is within the area labeled “4”, and is typically downslope from Till Upland Savanna ecological

sites. In places a thin band of Shale Backslope Savanna is present adjacent to the Upland Drainageway.



#	Ecological Site
1	Loess Upland Prairie
2	Till Upland Savanna
3	Interbedded Sedimentary Backslope Savanna
4	Loamy Upland Drainageway Savanna

Soil Features

These soils have no rooting restriction. The soils were formed under prairie vegetation, and have thick, dark-colored surface horizons. Parent material is alluvium. Surface horizons are silt loam. Subsurface horizons are loamy. These soils are not affected by seasonal wetness. Soil series associated with this site include Kennebec and Wiota.

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 plant community is characterized as a loamy bur oak savanna unit with a ground cover dominated by big and little bluestem, Indian grass, switch grass, eastern gamagrass and a wide variety of prairie wildflowers while other species such as Culver’s root, Michigan lily, and bunchflower add to the mix of upland drainageway prairie species. Slightly higher areas of the drainageways supported scattered bur oak, pin oak, elm, shellbark hickory and willow.

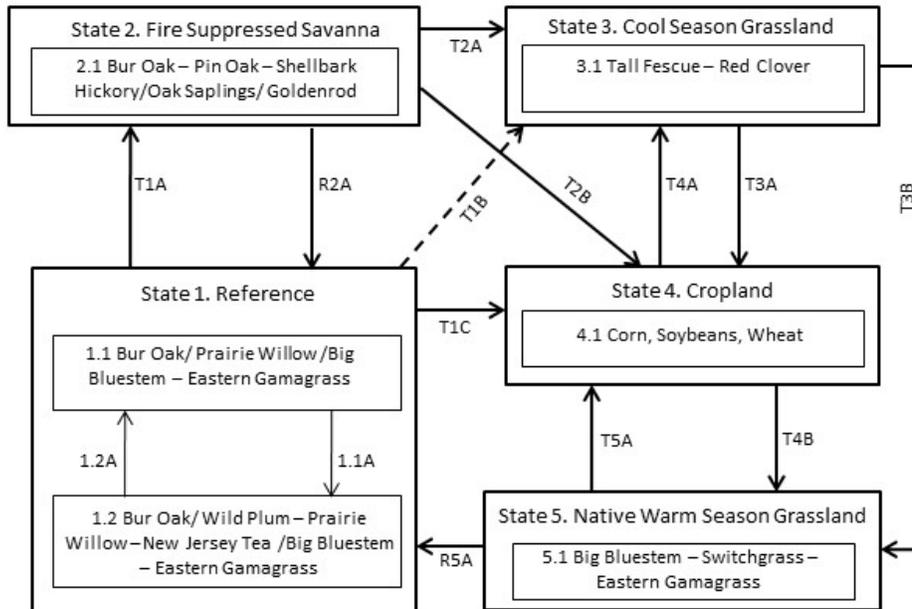
These areas flooded frequently but briefly. In addition to the flooding and periodic wetness, fire played a key role, likely occurring at least once every 3 years. Fire removed dead plant litter and provided room for a lush growth of prairie vegetation. Fire also controlled woody species. Grazing by native large herbivores, such as bison, elk, and deer, furthermore impacted these sites.

Their activities altered the composition, fuel loads and structure of the vegetation, creating a diversity of structure and composition. The partially wooded drainageway core would have burned less intensely and less frequently. During fire free intervals woody species would have increased in abundance and spread out into the landscape.

These sites are productive. Today, Loamy Upland Drainageway Savannas are nearly extirpated from the region as the former high terrace prairies and savannas have been converted to intensive agriculture. Very few, if any, quality remnants exist. While re-establishing prairie and savanna on converted agriculture sites is beneficial to wildlife, restoration to the reference state from agricultural land is a long term proposition with uncertain outcomes.

A State and Transition Diagram follows. 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.

Loamy Upland Drainageway Savanna, R109XY028MO



Code	Event/Activity/Process
T1A	Fire suppression >20 years; woody invasion
T1B	Tillage; vegetative seeding; grassland management
T1C, T3A, T5A	Tillage; conservation cropping system
T2A	Woody removal; tillage; vegetative seeding; grassland management
T2B	Woody removal; tillage; conservation cropping system
T4A	Vegetative seeding ; grassland management
T3B, T4B	Vegetative seeding; prescribed fire; grassland management
1.1A	Fire-free interval 10+ years
1.2A	Fire interval 1-3 years
R2A	Woody removal; thinning; prescribed fire 1-3 years
R5A	Vegetative seeding; prescribed fire 1-3 years; tree planting; long rotation

Ecological States

State 1: Reference

This state is native oak savanna dominated by an understory of big bluestem, eastern gamagrass and a wide variety of prairie forbs. This state occurs on loamy upland drainageways. Bur oak, pin oak, shellbark hickory, American elm, American hazelnut, prairie willow and wild plum occurred in small groves or as scattered individuals across the landscape.

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 prairie willow, dogwoods and wild plum. When fire intervals shorten these woody species will decrease.

This state is very rare. Nearly all former reference states have been converted to cool season grassland and intensive agriculture cropland or reverted to a woody invaded community.

State 2: Fire Suppressed Savanna

Degraded reference states that have experienced fire suppression and woody invasion for 20 or more years will transition to this state. With fire suppression, woody species such as bur oak, pin oak, and shellbark hickory will begin to increase transitioning this state from a savanna to an open woodland. Native herbaceous ground cover will also decrease.

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 may have scattered bur oaks. Long term uncontrolled grazing and a lack of grassland management can cause significant soil erosion and compaction and increases in less productive species such as Kentucky bluegrass and weedy forbs such as ironweed. A return to the reference state may be impossible, requiring a very long term series of management options.

State 4: Cropland

This is the dominant State that exists currently with intensive cropping of corn, wheat and soybeans occurring. Some conversion to cool season hay land may occur for a limited period of time before transitioning back to cropland. Limited acres are sometimes converted to native warm season grassland through federal set-aside programs.

State 5: Native Warm Season Grassland

Conversion from the 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 can be transformed back to a reference state. Substantial restoration time and management inputs and costs will still be needed.

Reference State Plant Community

Canopy Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
BUR OAK	<i>Quercus macrocarpa</i>	5-20	70
PIN OAK	<i>Quercus palustris</i>	5-20	80
SHELLBARK HICKORY	<i>Carya laciniosa</i>	5-20	70

Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
AMERICAN HAZELNUT	<i>Corylus americana</i>	5-10	5
NEW JERSEY TEA	<i>Ceanothus americanus</i>	5-10	4
LEAD PLANT	<i>Amorpha canescens</i>	5-10	3
PRAIRIE WILLOW	<i>Salix humilis</i>	5-20	5
WILD PLUM	<i>Prunus americana</i>	0-10	8

Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
LITTLE BLUESTEM	<i>Schizachyrium scoparium</i>	10-20
EASTEN GAMAGRASS	<i>Tripsacum dactyloides</i>	10-30
PRAIRIE DROPSEED	<i>Sporobolis heterolepis</i>	5-10
BIG BLUESTEM	<i>Andropogon gerardii</i>	30-50
INDIAN GRASS	<i>Sorghastrum nutans</i>	10-20
SWITCHGRASS	<i>Panicum virgatum</i>	10-20

Forbs

Common Name	Botanical Name	Cover % (low-high)
WILD QUININE	<i>Parthenium integrifolium</i>	5-20
BUTTERFLY WEED	<i>Asclepias tuberosa</i>	5-20
BLAZING STAR	<i>Liatris pycnostachya</i>	5-20
MISSOURI GOLDENROD	<i>Solidago missouriensis</i>	5-20
ASHY SUNFLOWER	<i>Helianthus mollis</i>	5-20
RATTLESNAKE MASTER	<i>Eryngium yuccifolium</i>	5-20
WHITE INDIGO	<i>Baptisia alba</i>	5-20
PRAIRIE MILKWEED	<i>Asclepias sullivantii</i>	5-20
FIELD MILKWORT	<i>Polygala sanguinea</i>	5-10
ROSWEEED	<i>Silphium integrifolium</i>	5-20
PURPLE PRAIRIE CLOVER	<i>Dalea purpurea</i>	5-20
PURPLE CONEFLOWER	<i>Echinacea purpurea</i>	5-20
COMPASS PLANT	<i>Silphium laciniatum</i>	5-20
HOARY PUCCOON	<i>Lithospermum canescens</i>	5-20
WILD BERGAMOT	<i>Monarda fistulosa</i>	5-20
CULVER'S ROOT	<i>Veronicastrum virginicum</i>	5-20
BUNCHFLOWER	<i>Melanthium virginicum</i>	5-20
MICHIGAN LILY	<i>Lilium michiganensis</i>	5-10

Site Interpretations

*Wildlife**

Prairie Phase:

- 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, and 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's 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

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

Eastern Meadowlark, Dickcissel, Field Sparrow, Upland Sandpiper, Greater Prairie Chicken, Northern Bobwhite, Eastern Kingbird, Bobolink, 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*, *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, Le Conte's Sparrow

- Amphibian and reptile species associated with this ecological site's reference state condition: prairies with or nearby to fishless ponds/pools (may be ephemeral) may have Eastern Tiger Salamander (*Ambystoma tigrinum tigrinum*) and Western Chorus Frog (*Pseudacris triseriata triseriata*); prairies with crawfish burrows may have Northern Crawfish Frog (*Rana areolata circulosa*); other species include Northern Prairie Skink (*Eumeces septentrionalis septentrionalis*), Ornate Box Turtle (*Terrapene ornata ornata*), Western Slender Glass Lizard (*Ophisaurus attenuatus attenuatus*), Eastern Yellow-bellied Racer (*Coluber constrictor flaviventris*), Prairie Ring-necked Snake (*Diadophis punctatus arnyi*), and Bullsnake (*Pituophis catenifer sayi*).
- Small mammals associated with this ecological site's reference state condition: Least Shrew (*Cryptotis parva*), Franklin's Ground Squirrel (*Spermophilus franklinii*), Plains Pocket Gopher (*Geomys bursarius*), Prairie Vole (*Microtus ochrogaster*), Southern Bog Lemming (*Synaptomys cooperi*), Meadow Jumping Mouse (*Zapus hudsonius*), Thirteen-lined Ground Squirrel (*Spermophilus tridecemlineatus*) and Badger (*Taxidea taxus*).
- Invertebrates: 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*), Golden Byssus butterfly (*Problema byssus kumskaka*), Delaware Skipper butterfly (*Atryone 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*), Green Grasshopper

(*Hesperotettix speciosus*) and Two-voiced Conehead katydid (*Neoconcephalus bivocatus*) are possible orthopteran associates of this ecological site.

Other invertebrate associates include the Grassland Crayfish (*Procambarus gracilis*).

Savanna Phase:

- Oaks and hickories provide an important food source for many animals including White-tailed Deer, Wild Turkey, and Fox Squirrel.
- Both snags and live cavity or den trees provide important food and cover for vertebrate wildlife. Snags are also very important to invertebrate species. Fox Squirrel, Red-headed Woodpecker and Eastern Bluebird utilize snags and den trees for foraging, nesting or shelter. “Wolf” trees are a particularly valuable type of live cavity tree. These large diameter, often open-grown, old-ages, hollow trees provide both cavities for wildlife and usually hard or soft mast food sources. Large diameter snags and den trees are particularly important wildlife habitat features to retain.
- 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’s reference state condition:
Breeding birds: Northern Bobwhite, Eastern Kingbird, Eastern Bluebird, Brown Thrasher, White-eyed Vireo, Prairie Warbler, Field Sparrow, Eastern Towhee, Red-headed Woodpecker, Great Crested Flycatcher, Loggerhead Shrike

Winter resident: American Tree Sparrow, Harris’ Sparrow

- Amphibian and reptile species likely associated with this ecological site’s reference state condition: Ornate Box Turtle (*Terrapene ornata ornata*), Northern Fence Lizard (*Sceloporus undulatus hyacinthinus*), Five-lined Skink (*Eumeces fasciatus*), Western Slender Glass Lizard (*Ophisaurus attenuatus attenuatus*), Eastern Yellow-bellied Racer (*Coluber constrictor flaviventris*), Prairie Ring-necked Snake (*Diadophis punctatus arnyi*), and Rough Green Snake (*Opheodrys aestivus aestivus*). Sites containing or nearby to fishless or ephemeral ponds/pools may support the Eastern Tiger Salamander (*Ambystoma tigrinum tigrinum*).

- Small mammals likely associated with this ecological site's reference state condition: Fox Squirrel (*Sciurus niger*), Woodland Vole (*Microtus pinetorum*), Least Shrew (*Cryptotis parva*), and Indiana Bat (*Myotis sodalis*). Indiana bats utilize suitable live, dying or dead roost trees for summer habitat and raising young. Suitable roost trees typically have exfoliating or flaking bark and are larger in diameter.
- Invertebrates – Many native insect species are likely associated with this phase of this ecological site's reference state condition, especially native bees, ants, beetles, butterflies and moths, and crickets, grasshoppers and katydid. However we don't have enough information on these groups to assign them to this phase of this ecological site's reference state condition at this time.

*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 were also 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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