Ecological Site Description

Loess Upland Prairie R107BY007MO

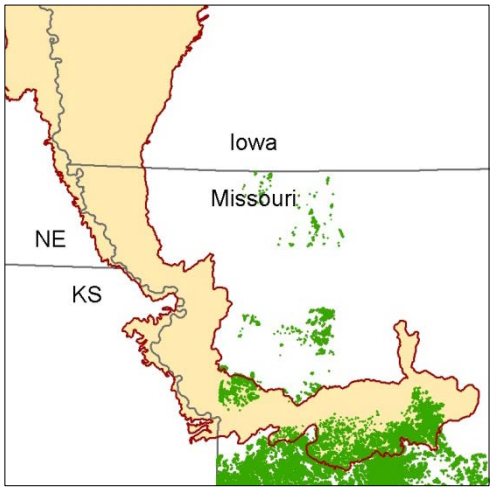
- *(/Amorpha canescens - Ceanothus americanus/Schizachyrium scoparium - Andropogon gerardii)*
- (/lead plant – New Jersey tea/little bluestem – big bluestem)

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: 107B – Iowa and Missouri Deep Loess Hills

Introduction

The Iowa and Missouri Deep Loess Hills (area outlined in red on the map) encompass the Missouri River floodplain and associated loess-covered uplands, from about Sioux City Iowa in the north to central Missouri. Elevation is about 1,565 feet on the highest ridges, to about 600 feet along the Missouri River near Glasgow in central Missouri. Local relief varies from 10 to 20 feet in the major river floodplains, to 50 to 100 feet in the dissected uplands, with loess bluffs of 200 to 300 feet along the Missouri River. The loess thins with distance from the Missouri river, and local relief decreases. The loess caps pre-Illinoian till, which crops out on lower hillslopes near the edges of the MLRA. The underlying bedrock is mainly Pennsylvanian and Cretaceous-aged shale, mudstone and sandstone.

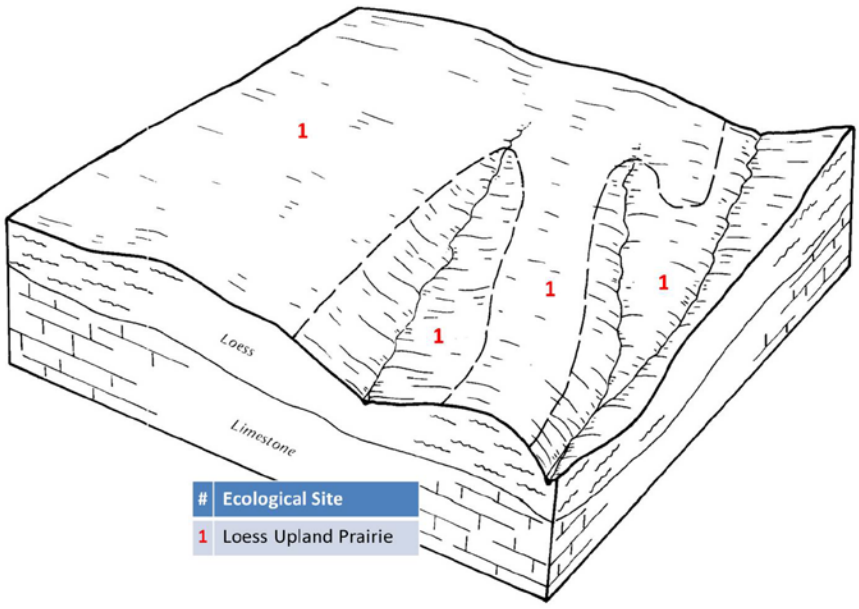


Loess Upland Prairies are within the green areas on the map (Missouri portion only; Iowa distributions are currently under review). These sites are primarily in the southern part of the MLRA, especially south of the Missouri River, and adjacent areas to the south. Soils are very deep, with clayey subsoils.

Physiographic Features

This site is on upland summit crests, shoulders and upper backslopes, with slopes of 1 to 14 percent. The site generates runoff to adjacent, downslope ecological sites. This site does not flood.

The following figure (adapted from Baker, 1993) shows the typical landscape position of this ecological site. In many areas, Loess Upland Prairies cover the entire landscape, as shown. Dashed lines within the Loess Upland Prairie indicate different soils within this site.



Soil Features
These soils have no major rooting restriction. The soils were formed under prairie vegetation, and have dark, organic-rich surface horizons. Parent material is loess. Some soils are underlain by pedisediment or shale residuum. The soils have silt loam surface horizons. Subsoils are silty clay loam to silty clay. Most soils are affected by seasonal wetness in spring months. Soil series associated with this site include Arisburg, Arispe, Haig, Macksburg, Pershing, and Polo.

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.

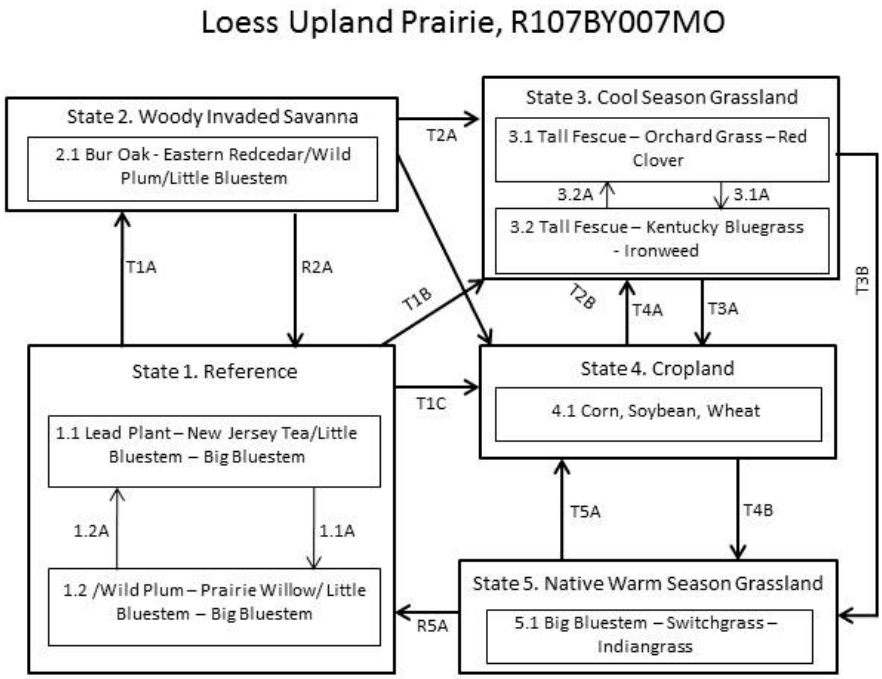
The reference native plant community is characterized as a tallgrass prairie unit dominated by little and big bluestem, Indian grass, sideoats grama, and a wide variety of prairie wildflowers. On lower slopes and draws where water periodically accumulates, more mesic prairie species such as switch grass, Eastern gama grass, cordgrass, Culver's root, Michigan lily, and bunchflower are added to the diverse mix of prairie species. In some cases, bur oak, swamp white oak, post oak, elm, American hazelnut, prairie willow and wild plum occurred in small groves or as scattered individuals across the prairie landscape.

These prairies were typically high, dry and fire prone. Consequently, 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 also 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 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.

This site is very productive. Today, Loess Upland Prairies are nearly extirpated from the region as the former prairies have been converted to intensive agriculture. A few known remnants exist but are degraded by fire suppression and grazing by domestic livestock. While planting prairie on former prairie 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 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 > 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
3.1A	Over grazing; no fertilization
3.2A	Vegetative seeding ; grassland management
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 tall grass prairie dominated by little bluestem, big bluestem and a wide variety of prairie wildflowers. This State occurs on level to gently sloping soils. In some cases, bur oak, swamp white oak, post oak, elm, American hazelnut, prairie willow and wild plum occurred in small groves or as scattered individuals across the prairie 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 rare. Most sites have been converted to cool season grassland and intensive agriculture cropland.

State 2: Woody Invaded Savanna
Degraded reference states that have experienced fire suppression for 20 or more years will transition to this state. With fire suppression, woody species such as bur oak and eastern redcedar will begin to increase transitioning this state from a prairie to a Woody Invaded Savanna. Native ground cover will also decrease and invasive species such as tall fescue may begin to dominate. Transition from this state to cool season grasslands (State 3) or intensive cropland (State 4) was very common.

State 3: Cool Season Grassland
Conversion of other states to non-native cool season species such as tall fescue, orchard grass and red clover has been common in this area. Occasionally, these pastures will 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, soybeans, and wheat occurring. Some conversion to cool season hayland occurs 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 is the most easily transformable state back to a Reference State. Substantial restoration time and management inputs will still be needed.

Reference State Plant Community

Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
PASTURE ROSE	*Rosa carolina*	5-10	2
NEW JERSEY TEA	*Ceanothus americanus*	5-10	4
LEAD PLANT	*Amorpha canescens*	5-20	3
PRAIRIE WILLOW	*Salix humilis*	0-10	3
WILD PLUM	*Prunus americana*	0-10	5

Forbs

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

Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
LITTLE BLUESTEM	*Schizachyrium scoparium*	30-50
EASTEN GAMA GRASS	*Tripsacum dactyloides*	5-10
PORCUPINE GRASS	*Stipa spartea*	5-10
PRAIRIE DROPSEED	*Sporobolis heretoeipis*	5-10
BIG BLUESTEM	*Andropogon gerardii*	20-30
INDIAN GRASS	*Sorghastrum nutans*	20-30
SWITCHGRASS	*Panicum virgatum*	10-20
SIDE OATS GRAMA	*Bouteloua curtipendula*	10-20

Site Interpretations

*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, 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 (< 1.5 feet, low litter levels, bare ground visible):
  Grasshopper Sparrow, Horned Lark, Upland Sandpiper, Greater Prairie Chicken, Northern Bobwhite

  Mid-Vegetation Height (1.5 – 3 feet, 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 (> 3 feet, 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. nymphaereum, Ashmeadiella bucconis, 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).*

*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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