

## *Ecological Site Description*

### **Interbedded Sedimentary Upland Savanna**

**R109XY010MO**

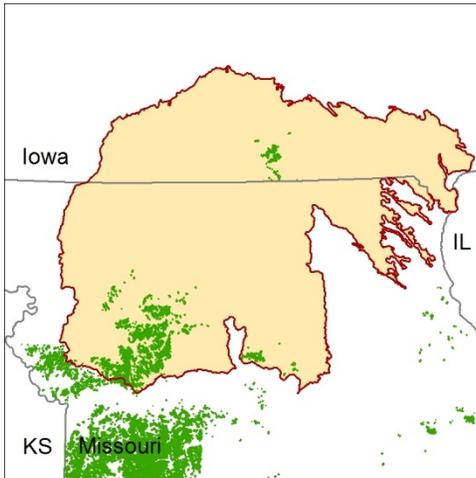
- (*Quercus macrocarpa*/*Amorpha canescens* - *Ceanothus americanus*/*Schizachyrium scoparium* - *Andropogon gerardii*)
- (bur oak/lead plant – New Jersey tea/little bluestem – big bluestem)

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:** 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 summits, 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.

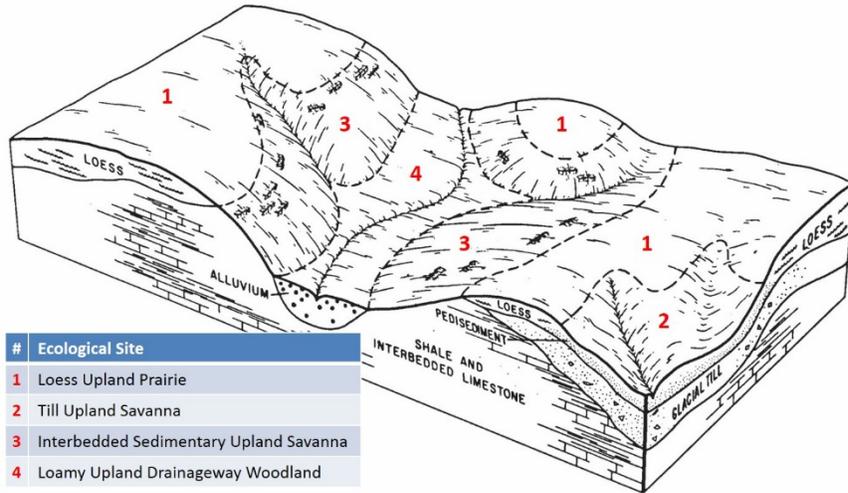
Interbedded Sedimentary Upland Savannas are within the green areas on the map. Most areas are in the southwestern part of the MLRA and on similar landscapes south of the Missouri River, and in south-central Iowa. This ecological site is on Pennsylvanian aged sediments that are typically interbedded shale, sandstone, siltstone and limestone. Soils are moderately deep to deep over interbedded sedimentary bedrock, and typically have sedimentary fragments in clayey subsoils..

### **Physiographic Features**

This site is on upland summits, shoulders and backslopes with slopes of 2 to 14 percent. The site generates runoff to adjacent, downslope ecological sites. This site does not flood.

The following figure (adapted from Preston, 1986) 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 “3”, and is typically downslope from Till Upland Savanna or Loess



Upland Prairie ecological sites. In most areas, Upland Drainageway or Floodplain ecological sites are directly downslope.

**Soil Features**

These soils are underlain with interbedded sedimentary bedrock at 20 to 60 inches deep. The soils were formed under prairie vegetation, and have dark, organic-rich surface horizons. Parent material is

slope alluvium and residuum weathered from interbedded shale, sandstone, siltstone and limestone, overlying sedimentary bedrock. They have silty clay loam or silt loam surface layers. Subsoils are silty clay loam to silty clay. Soils in areas with interbedded sandstone have more sand in the subsoil. Most of these soils are affected by seasonal wetness in spring months. Soil series associated with this site include Clanton, Dawn, Newcomer, Sampsel and Snead.

**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 an upland savanna unit dominated by little and big bluestem, Indian grass, sideoats grama, and a wide variety of prairie wildflowers. Bur oak, swamp white oak, post oak, and wild plum occurred as widely scattered individuals across the savanna landscape.

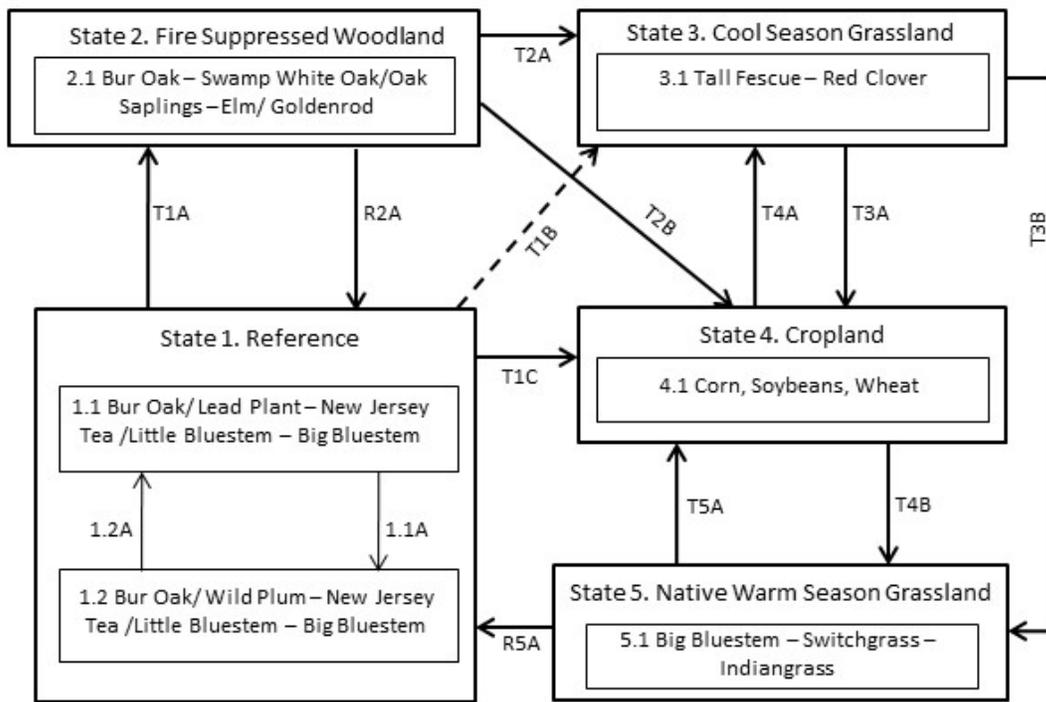
Located within a matrix of low relief prairie, this ecological site still burned every 1 to 3 years. Fire removed dead plant litter and provided room for a lush growth of prairie vegetation. Fire also kept woody species at bay. Grazing by native large herbivores, such as bison, elk, and deer, also impacted 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.

These sites are moderately productive. Today, Interbedded Sedimentary Upland Savannas are nearly extirpated from the region as the former prairies and savannas have been converted to

intensive agriculture. A few known remnants exist but are degraded by fire suppression and grazing by domestic livestock. 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.

### Interbedded Sedimentary Upland Savanna, R109XY010MO



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; 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 prairie cordgrass, big bluestem and a wide variety of prairie forbs. This state occurs on level to gently sloping soils. 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 extinct. All former reference states have been converted to cool season grassland and intensive agriculture cropland or reverted to a woodland community.

**State 2: Fire Suppressed Woodland**

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, post oak and swamp white oak will begin to increase transitioning this state from a savanna to a 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 will have scattered bur oaks and/or swamp white oak. 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 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 can be transformed back to a Reference State. Substantial restoration time and management inputs 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>	5-30	60
POST OAK	<i>Quercus stellata</i>	5-30	50
SWAMP WHITE OAK	<i>Quercus bicolor</i>	5-30	60

## Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
CAROLINA ROSE	<i>Rosa carolina</i>	5-10	2
NEW JERSEY TEA	<i>Ceanothus americanus</i>	5-10	4
LEAD PLANT	<i>Amorpha canescens</i>	5-20	3
PRAIRIE WILLOW	<i>Salix humilis</i>	5-10	3
WILD PLUM	<i>Prunus americana</i>	5-10	8

## 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
GOLDENROD	<i>Solidago missouriensis</i>	5-20
ASHY SUNFLOWER	<i>Helianthus mollis</i>	5-20
RATTLESNAKE MASTER	<i>Eryngium yuccifolium</i>	5-20
CREAM WHITE INDIGO	<i>Baptisia bracteata</i>	5-20
WHITE WILD INDIGO	<i>Baptisia alba</i>	5-20
PRAIRIE MILKWEED	<i>Asclepias sullivantii</i>	5-20
FIELD MILKWORT	<i>Polygala sanguinea</i>	5-20
ROSINWEED	<i>Silphium integrifolium</i>	5-20
ILLINOIS BUNDLE FLOWER	<i>Desmanthus illinoensis</i>	5-20
CULVER'S ROOT	<i>Veronicastrum virginicum</i>	5-20

## Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
LITTLE BLUESTEM	<i>Schizachyrium scoparium</i>	30-50
MEAD'S SEDGE	<i>Carex meadii</i>	5-10
BUSH SEDGE	<i>Carex bushii</i>	5-10
SPIKE RUSH	<i>Eleocharis tenuis</i>	5-10
SIDEOATS GRAMA	<i>Bouteloua curtipendula</i>	10-20
BIG BLUESTEM	<i>Andropogon gerardii</i>	30-50
INDIAN GRASS	<i>Sorghastrum nutans</i>	10-20
SWITCHGRASS	<i>Panicum virgatum</i>	5-10
EASTERN GAMAGRASS	<i>Tripsacum dactyloides</i>	5-10

## 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, 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*).

\*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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