

## *Ecological Site Description*

### **Loamy Footslope Forest**

**F116AY032MO**

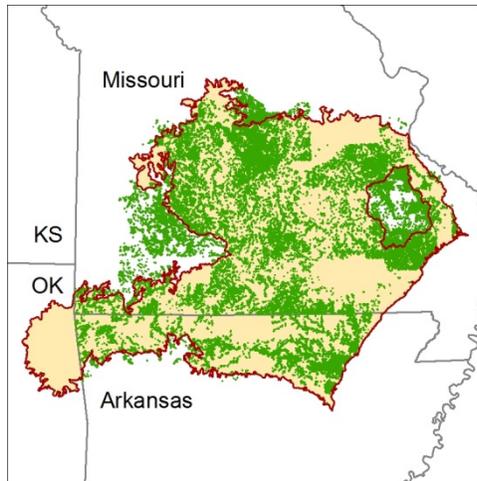
- (*Quercus alba* - *Quercus rubra*/*Lindera benzoin*/*Erigenia bulbosa* - *Asarum canadense*)
- (white oak – northern red oak/spicebush/harbinger of spring – wild ginger)

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:** 116A – Ozark Highland

### **Introduction**

The Ozark Highland (area outlined in red on the map) constitutes the Salem Plateau of the Ozark



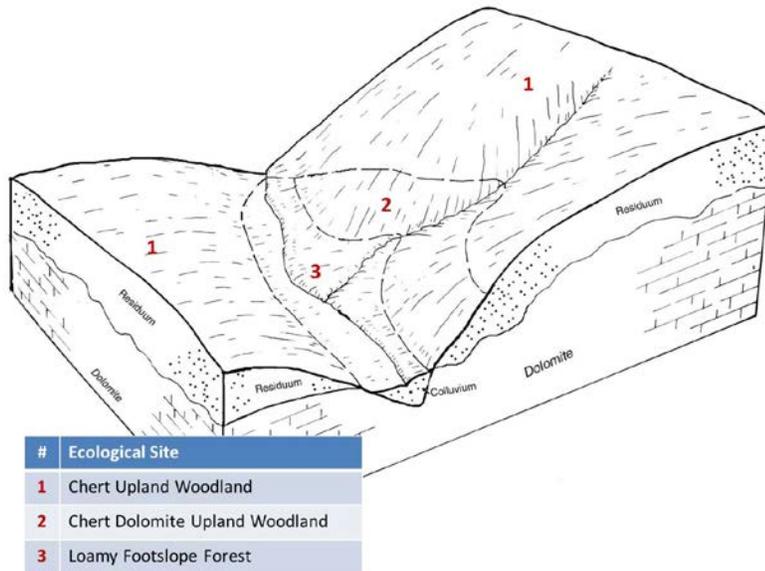
Uplift. Elevation ranges from about 300 feet on the southeast edge of the Ozark escarpment, to about 1,600 feet in the west, adjacent to the Burlington Escarpment of the Springfield Plateau. The underlying bedrock is mainly horizontally bedded Ordovician-aged dolomites and sandstones that dip gently away from the uplift apex in southeast Missouri. Cambrian dolomites are exposed on deeply dissected hillslopes. In some places, Pennsylvanian and Mississippian sediments overlie the plateau. Relief varies, from the gently rolling central plateau areas to deeply dissected hillslopes associated with drainageways such as the Current and Eleven Point Rivers.

Loamy Footslope Forests (green areas on the map) are widely distributed throughout the Ozark Highland. Soils are very deep, typically with loamy surfaces and loamy or clayey subsoils.

### **Physiographic Features**

This site is on footslopes and stream terraces, including high, loess-covered terraces, with slopes of 1 to 15 percent. The site receives runoff from adjacent upland sites. This site does not flood.

The following figure (adapted from Larsen, 2002) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. It is within the area labeled “3” on the figure. Loamy Footslope Forest sites may be downslope from a variety of upland sites, such as the Chert Upland and Chert Dolomite Upland sites shown here.



**Soil Features**

These soils have no rooting restriction. The soils were formed under forest vegetation, and have thin, light-colored surface horizons. Parent material is alluvium on stream terraces, and colluvium over residuum derived from limestone on footslopes. Loess is present in some soils, notably on higher terraces. Surface horizons are primarily silt loam. Subsurface horizons are loamy or clayey, with few to abundant gravel and cobbles at depth. These soils are not affected by seasonal wetness. Soil series associated with this site include Branson, Cornwall, Cotton, Courtois, Crider, Fourche, Gunlock, Lcoma, Peridge, Pomme, Skrainka, and Winnipeg.

**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.*

Loamy Footslope Forests occur along most streams throughout the region. The reference plant community was a well-developed forest dominated by a wide variety of deciduous hardwood tree species including white oak, sugar maple, northern red oak, bitternut hickory, American elm, walnut and Kentucky coffee tree. Trees are generally large and tall forming a dense, closed canopy. Both historically and today, these forests are structurally and compositionally diverse, with occasional tree-fall gaps and natural mortality providing opportunities for regeneration of overstory species. The understory is also complex, with multiple layers of shade tolerant species such as pawpaw, spicebush, Ohio buckeye and leatherwood. Grape vines, greenbriar, and Virginia creeper are also present along with a diverse array of ground flora species that carpets the forest floor.

In this region of historic fire-prone savannas and woodlands, Loamy Footslope Forests occur in the protected landscape positions on lower, concave slopes distant from the fire prone uplands. While the upland woodlands had an estimated fire frequency of 3 to 5 years, these sites burned much less frequently (estimated 10 to 25 years) and with lower intensity. In addition, Loamy Footslope Forests are subject to occasional disturbances from wind and ice, which periodically open the canopy up by knocking over trees or breaking substantial branches of canopy trees. Such canopy disturbances allow more light to reach the ground and favor reproduction of the dominant oak species.

Today, these communities have been cleared and converted to pasture, or have undergone repeated timber harvest and domestic grazing. Most existing occurrences have a younger (50 to 80 years) canopy layer whose composition may have been altered by timber harvesting practices. An increase in hickories over historic conditions is common.

Uncontrolled domestic grazing has also diminished the diversity and cover of woodland ground flora species, and has often introduced weedy species such as gooseberry, buckbrush, poison ivy and Virginia creeper. Grazed sites also have a more open understory. In addition, soil compaction and erosion related to grazing can lower site productivity.

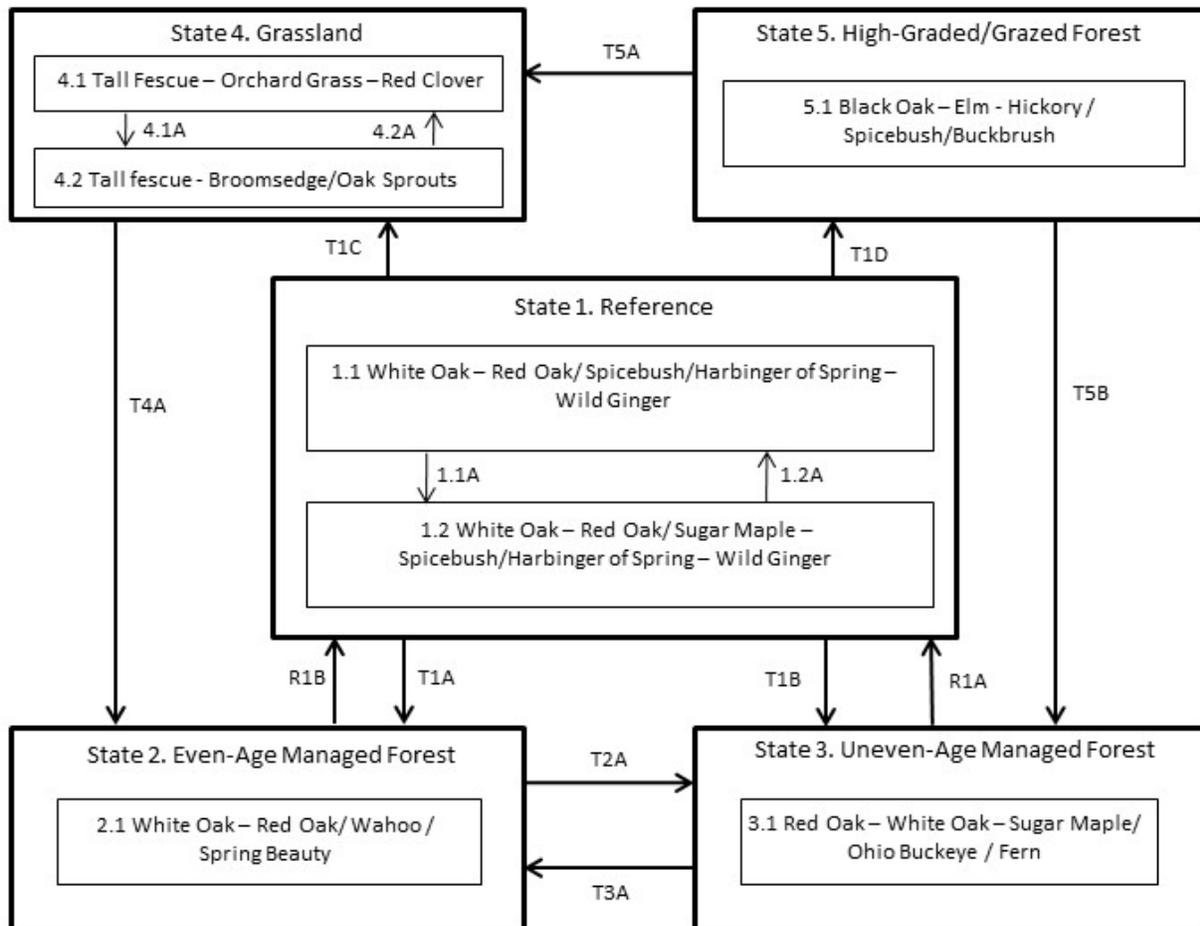
Loamy Footslope Forests are productive timber sites. Timber harvest in this region typically is done using single-tree selection, and often results in removal of the most productive trees, or high-grading of the stand. This can result in poorer quality timber and a shift in species composition away from more valuable oak species. Carefully planned single tree selection or the creation of group openings can help regenerate more desirable oak species and increase vigor on the residual trees. Clear-cutting does occur and results in dense, even-aged stands of primarily oak. This may be most beneficial for existing stands whose composition has been highly altered by past management practices. However, without some thinning of the dense stands, the ground flora diversity can be shaded out and productivity of the stand may suffer.

Prescribed fire can play a beneficial but limited role in the management of this ecological site. The higher productivity of these sites makes it more challenging than on other forest and woodland sites in the region. Control of woody species will be more difficult. Footslope forests did evolve with some fire, but their composition often reflects more closed, forested conditions, with fewer woodland ground flora species that can respond to fire. Consequently, while having these sites in a burn unit is acceptable, targeting them solely for woodland restoration is not advisable.

A State and Transition Diagram model 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**

**Loamy Foothlope Forest, F116AY032MO**



Code	Event/Process
T1A	Harvesting; even-aged management
T1B	Harvesting; uneven-age management
T1C, T5A	Clearing; pasture planting
T1D	High-grade harvesting; uncontrolled grazing
T2A	Uneven-age management
T3A	Even-age management
T4A, T5A	Tree planting; long-term succession; no grazing
T5B	Uneven-age management; tree planting; no grazing

Code	Event/Process
1.1A	No disturbance (10+ years)
1.2A	Disturbance (fire, wind, ice) < 10 years
4.1A	Over grazing; no fertilization
4.2A	Brush management; grassland seeding; grassland management

Code	Event/Process
R1A	Extended rotations
R1B	Uneven-age mgt, extended rotations

## Ecological States

### State 1: Reference

The reference state was dominated by white oak associated with red oak and other mixed hardwoods. Maximum tree age was likely 150 to 300 years. Periodic disturbances from fire, wind or ice maintained the dominance of white oak by opening up the canopy and allowing more light for white oak reproduction. Long disturbance-free periods allowed an increase in more shade tolerant species such as northern red oak and sugar maple. Two community phases are recognized in this state, with shifts between phases based on disturbance frequency.

The reference state can be found in scattered locations throughout the MLRA. Some sites have been converted to grassland (State 4). Others have been subject to repeated, high-graded timber harvests coupled with uncontrolled domestic livestock grazing (State 5). Many reference sites have been effectively managed for timber harvesting, resulting in either even-age (State 2) or uneven-age (State 3) managed forests depending upon the removal intensity and the species selection.

### State 2: Even-Age Managed Forest

This forest tends to be rather dense with an even-aged overstory and an under developed understory and ground flora. Thinning can increase overall tree vigor and improve understory diversity. Continual timber harvesting, depending on the practices used and age classes removed, will either maintain this state, or convert the site to uneven-age (State 3) forests.

This state can be restored to a reference state by modifying or eliminating timber harvests, extending rotations, incorporating selective thinning, and re-introducing prescribed fire.

### State 3: Uneven-Age Managed Forest

An uneven-age managed forest can resemble the reference state. The primary difference is tree age, most being only 50 to 90 years old. Composition is also likely altered from the reference state depending on tree selection during harvests and disturbance activities. Without a regular 15 to 20 year harvest re-entry into these stands, they will slowly increase in more shade tolerant species such as sugar maple (black maple in Iowa) and white oak will become less dominant. This state can be restored to a reference state by modifying timber harvests, extending rotations, incorporating selective thinning, and re-introducing prescribed fire.

### State 4: Grassland

Conversion of forests to planted, non-native cool season grasses and legumes has been common. Without proper grassland management these ecological sites are challenging to maintain in a healthy, productive state. With over grazing and cessation of active pasture management, tall fescue, white clover and multi-flora rose will increase in density.

### State 5: High-Graded/Grazed Forest

Reference or managed forested states subjected to repeated, high-grading timber harvests and uncontrolled cattle grazing transition to this degraded state. This state exhibits an over-abundance of hickory and other less economically desirable tree species and weedy understory species such as buckbrush, gooseberry, poison ivy and multi-flora rose. The vegetation offers little nutritional value for cattle, and excessive livestock stocking damages tree boles, degrades understory species composition and results in soil compaction and accelerated erosion and runoff. Cessation of active

logging and exclusion of livestock from sites in this state will create an idle phase that experiences an increase in black cherry and Ohio buckeye in the understory layer.

Transition back to either an even-age managed or uneven-age managed forest will require dynamic and sustained forest stand improvements, cessation of grazing, and selective thinning of overstory and understory canopies.

## Reference State Plant Community

### Canopy Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
WHITE OAK	<i>Quercus alba</i>	10-20	80
WHITE ASH	<i>Fraxinus americana</i>	5-20	80
KENTUCKY COFFEE TREE	<i>Gymnocladus dioicus</i>	5-20	70
HACKBERRY	<i>Celtis occidentalis</i>	5-20	70
BITTERNUT HICKORY	<i>Carya cordiformis</i>	5-20	80
AMERICAN ELM	<i>Ulmus americana</i>	5-20	70
SYCAMORE	<i>Platanus occidentalis</i>	5-20	90
BLACK WALNUT	<i>Juglans nigra</i>	5-20	70
NORTHERN RED OAK	<i>Quercus rubra</i>	10-20	80
SUGAR MAPLE	<i>Acer saccharum</i>	5-20	70

### Understory Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
OHIO BUCKEYE	<i>Aesculus glabra</i>	10-20	40
PAWPAW	<i>Asimina triloba</i>	10-20	20

### Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
WAHOO	<i>Euonymus atropurpureus</i>	10-20	8
SPICEBUSH	<i>Lindera benzoin</i>	10-20	6
LEATHERWOOD	<i>Dirca palustris</i>	10-20	6

### Vines

Common Name	Botanical Name	Cover % (low-high)
VIRGINIA CREEPER	<i>Parthenocissus quinquefolia</i>	10-20
SUMMER GRAPE	<i>Vitis aestivalis</i>	10-20
POISON IVY	<i>Toxicodendron radicans</i>	10-20

### Forbs

Common Name	Botanical Name	Cover % (low-high)
BLUE PHLOX	<i>Phlox divaricata</i>	5-20
BELLWORT	<i>Uvularia grandiflora</i>	5-20
SPRING BEAUTY	<i>Claytonia virginica</i>	5-20
WATERLEAF	<i>Hydrophyllum virginianum</i>	5-20
BLUE BELLS	<i>Mertensia virginica</i>	5-20
WHITE TROUT LILY	<i>Erythronium albidum</i>	5-20
HARBINGER OF SPRING	<i>Erigenia bulbosa</i>	10-20
CUT-LEAF TOOTHWORT	<i>Cardamine concatenata</i>	10-20
WILD GINGER	<i>Asarum canadense</i>	10-20

## Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
EASTERN STAR SEDGE	<i>Carex radiata</i>	5-10
WOOD REED GRASS	<i>Cinna arundinacea</i>	5-10

**Site Interpretations***Wildlife*

- This forest type contains high structural and compositional diversity important for a number of songbirds and amphibians.
- Bird species associated with early-successional Footslope Forests are Prairie Warbler, Field Sparrow, Brown Thrasher, Blue-winged Warbler, White-eyed Vireo, Blue-gray Gnatcatcher, Yellow-breasted Chat, Indigo Bunting, and Eastern Towhee.
- Birds associated with mid-successional Footslope Forests include Whip-poor-will and Wood Thrush.
- Birds associated with late-successional Footslope Forests include Worm-eating warbler, Whip-poor-will, Great Crested Flycatcher, Ovenbird, Pileated Woodpecker, Wood Thrush, Red-eyed Vireo, Northern Parula, Louisiana Waterthrush (near streams), and Broad-winged Hawk.
- Reptile and amphibian species associated with mature Footslope Forests include: ringed salamander, spotted salamander, marbled salamander, central newt, long-tailed salamander, dark-sided salamander, southern red-backed salamander, three-toed box turtle, western worm snake, western earth snake, and American toad.

*Forestry*

- **Management:** Site index values range from 58 to 68 for oak. Timber management opportunities are good. These groups respond well to management. Create group openings of at least 2 acres. Large clearcuts should be minimized if possible to reduce impacts on wildlife and aesthetics. Uneven-aged management using single tree selection or small group selection cuttings of ½ to 1 acre are other options that can be used if clear cutting is not desired or warranted. Using prescribed fire as a management tool could have a negative impact on timber quality, may not be fitting, or should be used with caution on a particular site if timber management is the primary objective. Favor white oak and northern red oak and black walnut when present.
- **Limitations:** No major equipment restrictions or limitations exist. Erosion is a hazard when slopes exceed 15 percent. On steep slopes greater than 35 percent, traction problems increase and equipment use is not recommended.

**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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