Ecological Site Description

Interbedded Sedimentary Exposed Backslope Woodland F109XY025MO

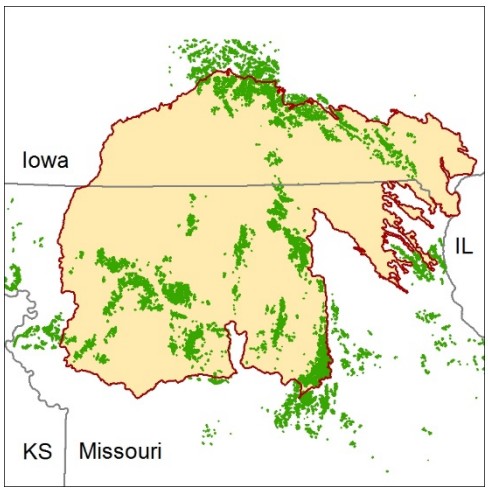
- *(Quercus alba - Quercus velutina/Rhus aromatica/Schizachyrium scoparium - Helianthus hirsutus)*
- (white oak – black oak/fragrant sumac/little bluestem – hairy sunflower)

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 interfluve divides and alluvial valleys. Elevation ranges from about 660 feet along the lower reaches of rivers, to about 980 feet on stable interfluve summits in southern Iowa. Relief is about 80 to 160 feet between major streams and adjacent interfluve 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-Illinoisan aged till on interfluves, whereas the till is exposed on side slopes. Mississippian age limestone and Pennsylvanian aged sandstone and shale crop out on lower slopes in some areas.



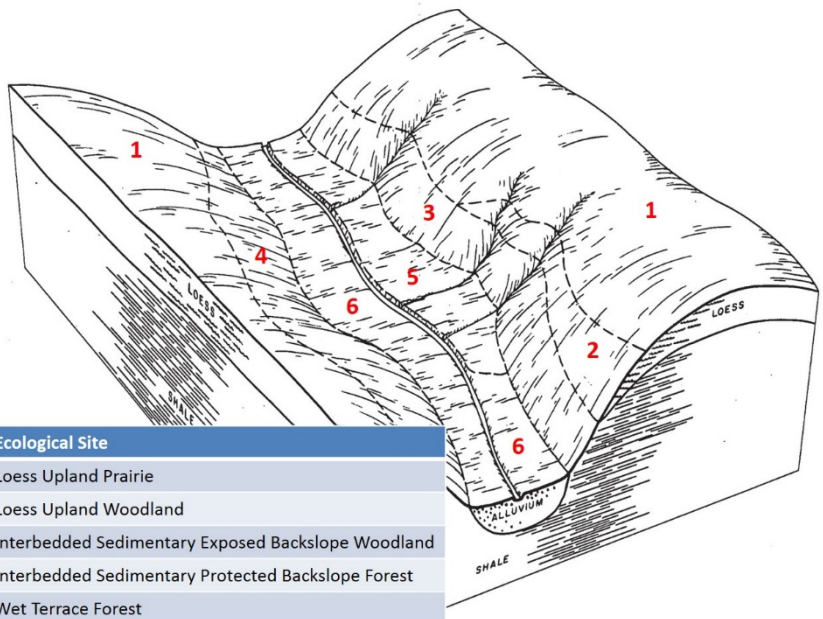
Interbedded Sedimentary Exposed Backslope Woodlands are within the green areas on the map. They occupy the southerly and westerly aspects of steep, dissected slopes, and are mapped in complex with the Interbedded Sedimentary Protected Backslope Forest ecological site. Sites are scattered throughout the MLRA, on Pennsylvanian aged sediments that are typically interbedded shale, sandstone, siltstone and limestone. Soils are moderately deep over interbedded sedimentary bedrock, and typically have sedimentary fragments in clayey subsoils. The reference plant community is woodland with an overstory dominated by white oak and black oak, and a ground flora of native grasses and forbs.

Physiographic Features

This site is on upland backslopes with slopes of 14 to 50 percent. It is on exposed aspects (south, southwest, and west), which receive significantly more solar radiation than the protected aspects.

The site receives runoff from upslope summit and shoulder sites, and generates runoff to adjacent, downslope ecological sites. This site does not flood.

The following figure (adapted from Oelmann, 1984) shows the typical landscape position of this ecological site, and landscape relationships among the major ecological sites in the uplands and adjacent floodplains. Considering that north is towards the top of the diagram, the site is within the area labeled "3", on southerly and westerly aspects. This site is typically downslope from Loess or Till Upland ecological sites. Upland Drainageway or Floodplain ecological sites are directly downslope.



#	Ecological Site
1	Loess Upland Prairie
2	Loess Upland Woodland
3	Interbedded Sedimentary Exposed Backslope Woodland
4	Interbedded Sedimentary Protected Backslope Forest
5	Wet Terrace Forest
6	Wet Floodplain Prairie

Soil Features

These soils are underlain with interbedded sedimentary bedrock at 20 to 40 inches deep. Some areas are underlain by soft shale at shallower depths. The soils were formed under woodland vegetation, and have thin, light-colored 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, with low to moderate amounts of sedimentary fragments. Some soils are slightly affected by seasonal wetness. Soil series associated with this site include Gosport, Locksprings, Mandeville, Munterville, Norris, Reger, and Vanmeter.

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 woodland dominated by an overstory of white oak and black oak and occasional hickories, bur oak and post oak. This woodland type has a moderate canopy closure (50 to 80 percent), with an open understory and a dense, diverse herbaceous ground flora.

Woodlands are distinguished from forest, by their relatively open understory, and the presence of sun-loving ground flora species.

Fire played an important role in the maintenance of these systems. Because these sites normally occur next to the prairie edge, it is likely that these ecological sites burned at least once every 3 to 5 years. These periodic fires kept woodlands open, removed the litter, and stimulated the growth and flowering of the grasses and forbs. During fire free intervals, woody understory species increased and the herbaceous understory diminished. The return of fire would open the woodlands up again and stimulate the abundant ground flora.

Today, this community has either been cleared and converted to pasture, or has grown dense in the absence of fire. Most occurrences today exhibit canopy closure of 80 to 100 percent. In addition, the sub-canopy and understory layers are better developed. Black oak and hickory now share dominance with white oak and there are considerably more saplings in the understory. Under these denser, more shaded conditions, the original sun-loving ground flora has diminished in diversity and cover. While some woodland species persist in the ground flora, many have been replaced by more shade-tolerant species.

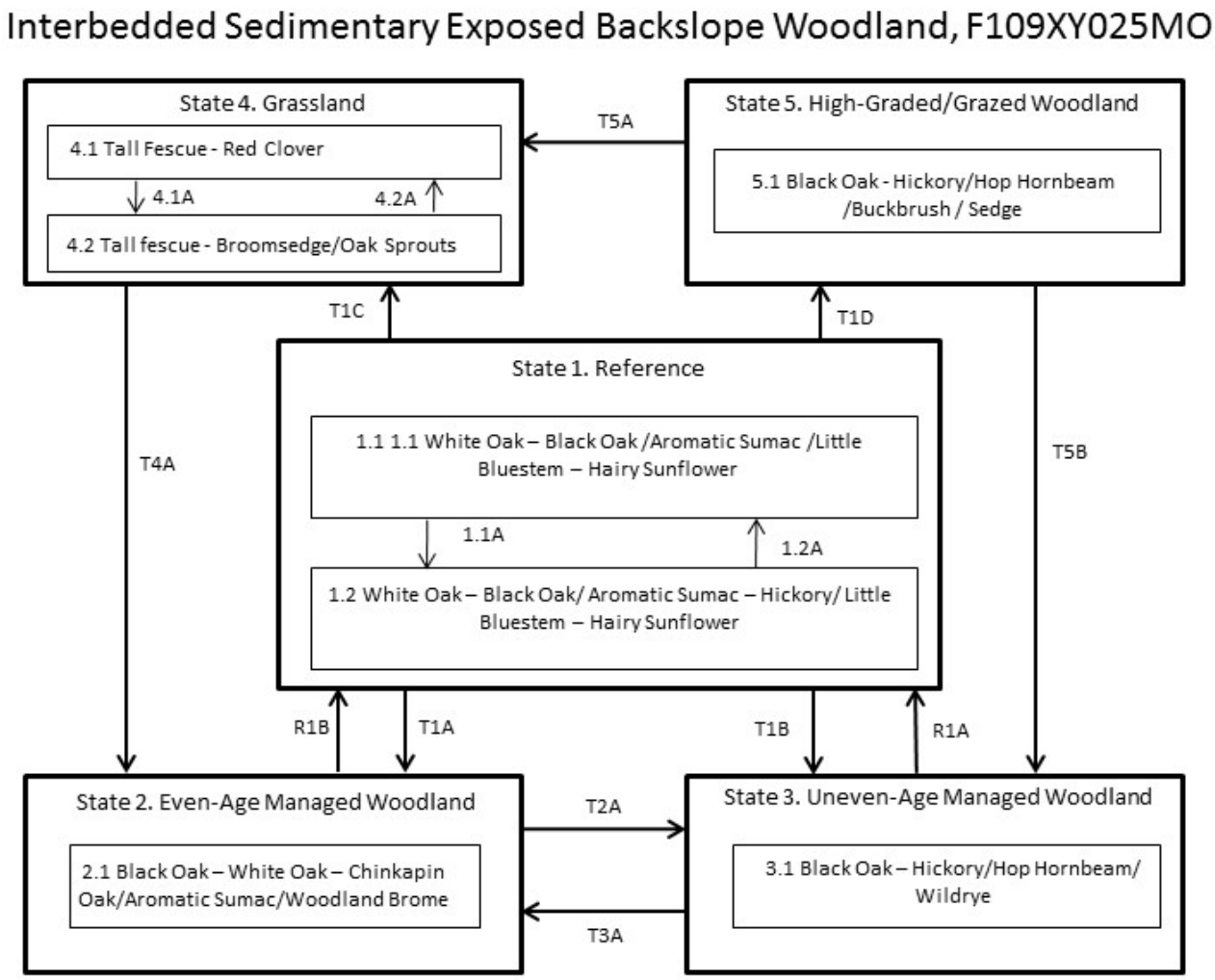
In the long term absence of fire, woody species, especially hickory, hophornbeam and gooseberry encroach into these woodlands. Once established, these woody plants can quickly fill the existing understory increasing shade levels, greatly diminishing ground flora. Opening the canopy, removing the younger understory and applying prescribed fire have proven to be effective restoration means.

Uncontrolled domestic grazing has also impacted these communities, further diminishing the diversity of native plants and introducing species that are tolerant of grazing, such as buckbrush, gooseberry, and Virginia creeper. Grazed sites also have a more open understory. In addition, soil compaction and soil erosion related to grazing can be a problem and lower site productivity.

This ecological site, if managed properly, can be a source for timber products. Most areas on this ecological site have been repeatedly logged and high graded. Even-age management, using clearcut, or shelterwood and seed tree harvest systems without fire will perpetuate the overly dense, shaded conditions of current stands. Partial selective cutting and prescribed fire can, however, restore the more open structure and diversity of ground flora species. Managed areas show an exceptional resiliency and production. Characteristic plants in the ground flora can be used to gauge the restoration potential of a stand along with remnant open-grown old-age trees, and tree height growth. This type of management can provide timber products, wildlife habitat, and potential native forage.

A state-and-transition model 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/Process
T1A	Even-aged management
T1B	Fire suppression; uneven-age management
T1C, T5A	Clearing & pasture planting
T1D	Poorly planned harvest & uncontrolled grazing
T2A	Uneven-age management
T3A	Even-age management
T4A, T5A	Tree planting; long-term succession; no grazing
T4B	Uneven-age management; no grazing; forest stand improvement

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

Code	Event/Process
R1A	Prescribed fire & extended rotations
R1B	Uneven-age mgt, extended rotations

Ecological States

State 1: Reference
The reference state for this ecological site was old growth oak woodland dominated by black oak, and white oak. Maximum tree age was likely 150 to 300 years. Periodic disturbances from fire, wind or ice maintained the woodland structure and diverse ground flora species. Long disturbance-free periods allowed an increase in both the density of trees and the abundance of shade tolerant species. Two community phases are recognized in the reference state, with shifts between phases based on disturbance frequency.

This reference state is uncommon today. Some sites have been converted to grassland (State 4). Others have been subject to repeated, high-graded timber harvest coupled with domestic livestock grazing (State 5). Fire suppression has resulted in increased canopy density, which has affected the abundance and diversity of ground flora. Many reference sites have been managed for timber harvest, resulting in either even-age (State 2) or uneven-age (State 3) forests.

State 2: Even-Age Managed Woodland
This state starts with a sequence of early seral white oak woodlands, which mature over time. These woodlands tend to be rather dense, with an under developed understory and ground flora. Thinning can increase overall tree vigor and improve understory diversity. Continual timber management, depending on the practices used, will either maintain this state, or convert the site to uneven-age (State 3) woodlands.

State 3: Uneven-Age Managed Woodland
Uneven-Age Managed woodlands resemble the reference state. The biggest 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 harvest. In addition, 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 and white oak will become less dominant.

State 4: Grassland
Type conversion of woodlands to planted, non-native pasture species such as tall fescue has been common in this MLRA. Steep slopes, abundant surface fragments, low organic matter contents and soil acidity make non-native pastures challenging to maintain in a healthy, productive state on this ecological site. If grazing and active pasture management is discontinued, the site will eventually transition to State 2 (Even-Age).

State 5: High-Graded Grazed Woodland
Ecological sites subjected to repeated, high-graded timber harvests and uncontrolled domestic grazing transition to this State. This state exhibits an over-abundance of hickory and other less desirable tree species, and weedy understory species such as buckbrush, gooseberry, poison ivy and Virginia creeper. The vegetation offers little nutritional value for cattle, and excessive stocking damages tree boles, degrades understory species composition and results in soil compaction and accelerated erosion and runoff. Exclusion of livestock from sites in this state coupled with uneven-age management techniques will cause a transition to State 3 (Uneven-Age).

Reference State Plant Community

Canopy Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
WHITE OAK	*Quercus alba*	40-70	70
BLACK OAK	*Quercus velutina*	20-40	80
MOCKERNUT HICKORY	*Carya alba*	5-10	70
SHAGBARK HICKORY	*Carya ovata*	5-10	60
POST OAK	*Quercus stellata*	5-10	60
CHINKAPIN OAK	*Quercus muehlenbergii*	5-10	70

Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
HAZELNUT	*Corylus americana*	10-20	4
FRAGRANT SUMAC	*Rhus aromatica*	10-30	3
NEW JERSEY TEA	*Ceanothus americanus*	5-20	3

Forbs

Common Name	Botanical Name	Cover % (low-high)
ELM-LEAFED GOLDENROD	*Solidago ulmifolia*	5-20
HAIRY SUNFLOWER	*Helianthus hirsutus*	10-30
SMOOTH BLUE ASTER	*Aster laevis*	10-20
PURPLE CONEFLOWER	*Echinacea purpurea*	5-20
NAKED FLOWER TICK TREFOIL	*Desmodium nudiflorum*	10-20
SLENDER LESPEDEZA	*Lespedeza virginica*	10-20
CANADIAN BLACKSNAKEROOT	*Sanicula canadensis*	10-20
EASTERN BEEBALM	*Monarda bradburiana*	10-20
WHORLED MILKWEED	*Asclepias quadrifolia*	10-20
CULVER'S ROOT	*Veronicastrum virginicum*	5-10
SMOOTH SPIDERWORT	*Tradescantia ohiensis*	5-10

Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
WOODLAND BROME	*Bromus pubescens*	5-20
BIG BLUESTEM	*Andropogon gerardii*	5-20
LITTLE BLUESTEM	*Schizachyrium scoparium*	10-30
PENNSYLVANIA SEDGE	*Carex pensylvanica*	5-20
PARASOL SEDGE	*Carex umbellata*	5-20
ROCK MUHLY	*Muhlenbergia sobolifera*	5-20
VIRGINIA WILD-RYE	*Elymus virginicus*	5-20
BOTTLEBRUSH GRASS	*Elymus hystrix*	5-20

Site Interpretations

Wildlife

- Wild turkey, white-tailed deer, and eastern gray squirrel depend on hard and soft mast food sources and are typical upland game species of this type.
- Oaks provide hard mast; scattered shrubs provide soft mast; native legumes provide high-quality wildlife food;

- Sedges and native cool-season grasses provide green browse; patchy native warm-season grasses provide cover and nesting habitat; and a diversity of forbs provides a diversity and abundance of insects.
- Post-burn areas can provide temporary bare-ground – herbaceous cover habitat important for turkey poults and quail chicks.
- Bird species associated with mature communities include Indigo Bunting, Red-headed Woodpecker, Eastern Bluebird, Northern Bobwhite, Eastern Wood-Pewee, Broad-winged Hawk, Great-Crested Flycatcher, Summer Tanager, and Red-eyed Vireo.
- Reptile and amphibian species associated with the Loess Upland Woodland include tiger salamander, small-mouthed salamander, ornate box turtle, northern fence lizard, five-lined skink, broad-headed skink, flat-headed snake, and rough earth snake.

Forestry

- Management: Field measured site index values for oak range from 51 for post oak, 62 for red oak and 54 for white oak. Timber management opportunities are moderate. 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. These sites respond well to prescribed fire as a management tool. Favor white oak, black oak, chinkapin oak, and post oak.

- Limitations: Clay in upper portion of soil profile; seasonal wetness. Clayey soils have reduced traction and compact easily when wet. Unsurfaced roads and skid trails may be impassable during rainy periods. Restrict activities to dry periods or surfaced areas. Seedling mortality may be high during the summer because of lack of adequate soil moisture, especially on south facing slopes. The use of equipment is restricted in spring and other wet periods. The surface layer is firm when dry and sticky when wet and becomes cloddy if tilled. Erosion is a hazard when slopes exceed 15 percent. On steep slopes greater than 35%, 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

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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