Ecological Site Description

Low-Base Chert Protected Backslope Woodland F116BY010MO

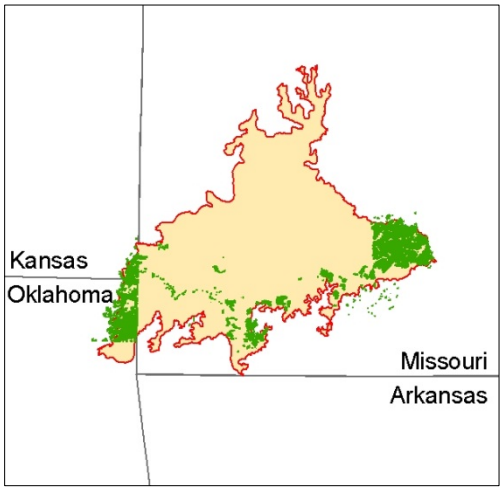
- *(Quercus alba - Quercus velutina/Amelanchier arborea/Desmodium)*
- (white oak – black oak/common serviceberry/tick trefoil)

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: 116B – Springfield Plain

Introduction

The Springfield Plain (area outlined in red on the map) is in the western part of the Ozark Uplift. It is primarily a smooth plateau with some dissection along streams. Elevation is about 1,000 feet in the north to over 1,700 feet in the east along the Burlington Escarpment adjacent to the Ozark Highlands. The underlying bedrock is mainly Mississippian-aged limestone, with areas of shale on lower slopes and structural benches, and intermittent Pennsylvanian-aged sandstone deposits on the plateau surface.



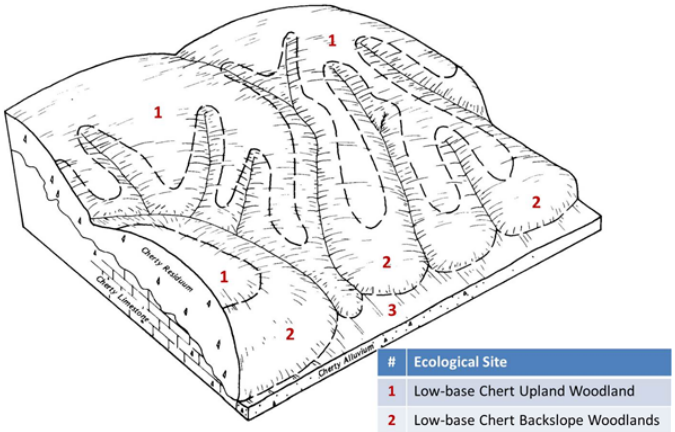
Low-base Chert Protected Backslope Woodlands (green areas on the map) occur on steep backslopes with northern and eastern aspects. In Missouri they are prevalent in the easternmost lobe of the Springfield Plain in the upper watersheds of the James River and Finley Creek. They are also prevalent on steep backslopes in the Spring River watershed in SW Kansas and NE Oklahoma. This site is mapped in complex with the Low-base Chert Exposed Backslope Woodland ecological site. Soils are typically very deep, acidic, and low in bases such as calcium, with an abundance of chert fragments. As a soil profile approaches or arrives at lower levels of pH, exchangeable aluminum comes into solution and can directly impact plant growth and composition. Black oak and shortleaf pine (within its natural range) are more abundant on soils with these low base concentrations or quantities. Soils having low concentrations of calcium and containing few calcium bearing minerals along with increased levels of aluminum may also be vulnerable to base depletion by timber harvesting, plant uptake, and leaching.

Physiographic Features

This site is on upland backslopes with slopes of 15 to 50 percent. It is on protected aspects (north, northeast, and east), which receive significantly less solar radiation than the exposed 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 adjacent figure (adapted from Aldrich, 1989) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. Low-base Chert Protected Backslope Woodland sites are within the area labeled "2", on lower backslopes with northerly to easterly exposures. Low-base Chert Exposed Backslope Woodland sites are on the corresponding southerly to westerly exposures. Low-base Chert Upland Woodland sites, labeled "1", are typically upslope on crests and shoulders.



#	Ecological Site
1	Low-base Chert Upland Woodland
2	Low-base Chert Backslope Woodlands
3	Gravelly/Loamy Upland Drainageway Woodland

Soil Features

These soils have acidic subsoils that are low in bases. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is slope alluvium over residuum weathered primarily from limestone. They have very gravelly or very cobbly silt loam surface horizons, and skeletal subsoils with high amounts of chert gravel and cobbles. They are not affected by seasonal wetness. Soil series associated with this site include Clarksville, Crackerneck, and Noark.

Ecological Dynamics

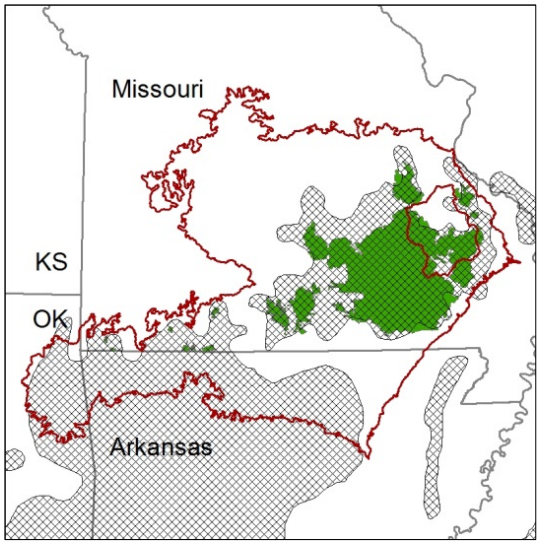
Information contained in this section was developed using historical data, professional experience, field reviews, and scientific studies. The information presented is representative of very complex vegetation communities. Key indicator plants, animals and ecological processes are described to help inform 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 well developed woodland dominated by an overstory of white oak and black oak. Shortleaf pine also occurred within its natural pine range. It is very similar to Chert Upland Woodlands, except that it may be less dense and productive. The canopy is rather tall (60 to 80 feet) and more dense (65 to 85 percent closure) than exposed slopes and the understory is better developed with more structural diversity. Decreased light from the canopy and aspect causes the diversity of ground flora species to diminish.

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

Species composition and structure of the reference plant community varies for this ecological site based on its historic native shortleaf pine range. Fragmentary evidence from old records indicate that the original timber stands in the Ozark Highlands contained a large volume of shortleaf pine on small, scattered areas, (green area on map below) but a relatively small volume of shortleaf pine on extensive areas (Fletcher and McDermott, 1957). Extreme soil chertiness and low soil bases are unifying soil features of these community phases.

Fire played an important role in the maintenance of Low-base Chert Protected Backslope Woodlands. It is likely that these ecological sites burned at least once every 5 to 10 years, although with lower intensity than exposed slopes. 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.



Range map with cross-hatching showing the historic distribution of shortleaf pine in the Midwest. Green shading show areas where shortleaf pine was a dominate overstory species.

Low-base Chert Protected Backslope Woodlands were also subjected to occasional disturbances from wind and ice, as well as grazing by native large herbivores. Wind and ice would have periodically opened the canopy up by knocking over trees or breaking substantial branches off canopy trees. Grazing by native herbivores would have effectively kept understory conditions more open, creating conditions more favorable to oak reproduction and sun-loving ground flora species.

Today, these ecological sites have been cleared and converted to pasture or have undergone repeated timber harvest and domestic grazing. Most existing forested ecological sites have a younger (50-80 years) canopy layer whose species composition and quality has been altered by timber harvesting practices. In the long term absence of fire, woody species, especially hickory, encroach into these woodlands. Once established, these woody plants can quickly fill the existing understory increasing shade levels with a greatly diminished ground flora. Removal of the younger understory and the application of 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 from grazing can be a problem and lower site productivity.

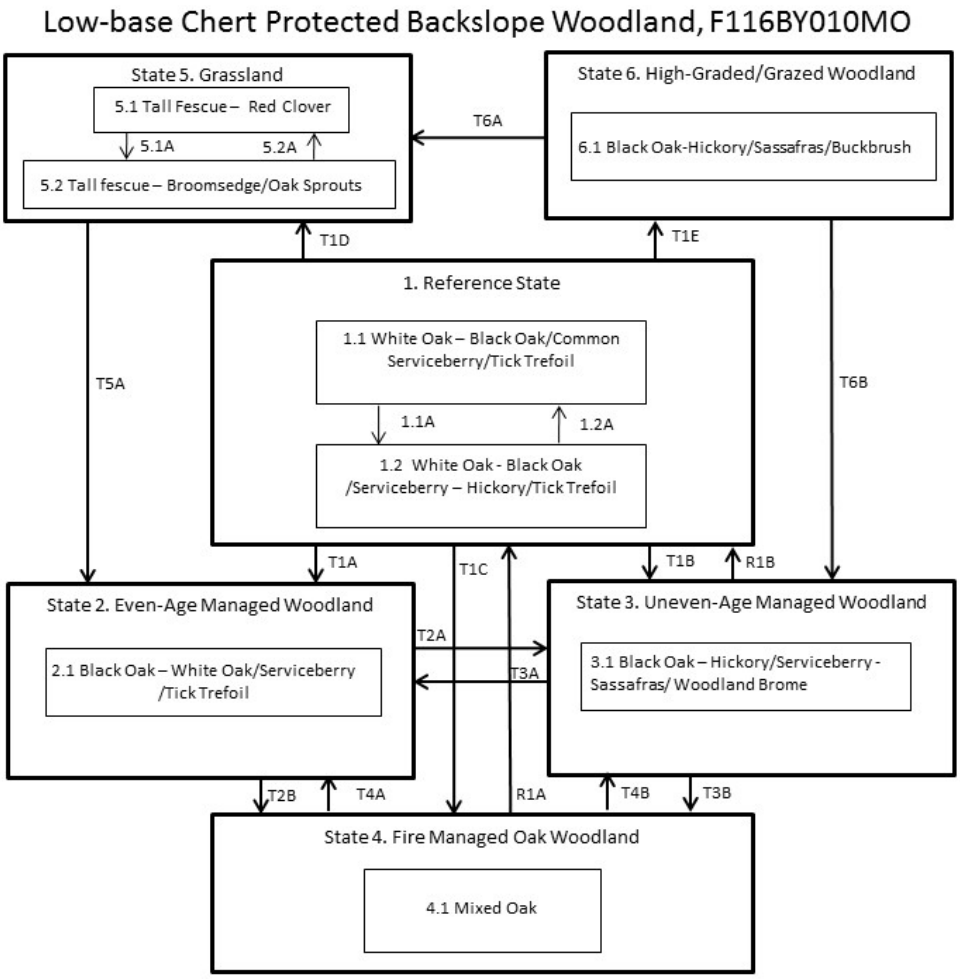
These ecological sites are only moderately productive, especially when compared to adjacent loess covered units. Oak regeneration is typically problematic. Sugar maple, red maple, red elm, and hickories are often dominant competitors in the understory. Maintenance of the oak component will require disturbances that will encourage more sun adapted species and reduce shading effects.

Single tree selection timber harvests are common with this site and often results in removal of the most productive trees (high grading) in the stand leading to poorer quality timber and a shift in species composition away from more valuable oak species. Better planned single tree selection or the creation of group openings can help regenerate and maintain more desirable oak species and increase vigor on the residual trees.

Clearcutting also occurs and results in dense, even-aged stands dominated by 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 and the reintroduction of prescribed fire, the ground flora diversity can be shaded out and diversity of the stand may suffer.

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/Process
T1A	Fire suppression; clearcut; even-age mgt
T1B	Fire suppression; single tree selection; uneven-age mgt
T1C, T2B, T3B	Prescribed fire; forest stand improvement
T1D, T6A	Clearing & pasture planting
T1E	Poorly planned harvest & grazing
T2A, T4B	Uneven-age mgt
T3A, T4A	Even-age mgt
T5A	Tree planting; long-term succession
T6B	Uneven-age mgt; tree planting
R1A	Extended rotations
R1B	Uneven-age mgt, extended rotations

Code	Event/Process
1.1A, 2.1A, 3.1A	No disturbance (10+ yrs)
1.2A	Disturbance (fire, wind, ice) < 10 yrs
2.2A	Even-age mgt.
3.2A	Uneven-age mgt.

Ecological States

State 1: Reference

The historical reference state for this ecological site was likely dominated by white oak, black oak and post oak. Scattered shortleaf pine may also have been present in the canopy. 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. Many sites have been converted to grassland (State 5). Others have been subject to repeated, high-graded timber harvest coupled with domestic livestock grazing (State 6). 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) woodlands.

State 2: Even-Age Managed Woodland
These woodlands tend to be rather dense, with a sparse understory and ground flora. Thinning can increase overall tree vigor and improve understory diversity. However, in the absence of fire, the diversity and cover of the ground flora is still diminished. Continual timber management, depending on the practices used, will either maintain this state, or convert the site to uneven-age (State 3) woodlands. Prescribed fire without extensive timber harvest will, over time, cause a transition to Managed Oak Woodlands (State 4).

State 3: Uneven-Age Managed Woodland
Composition is 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 and white oak will become less dominant. Without periodic disturbance, stem density and fire intolerant species, like hickory, increase in abundance.

State 4: Fire Managed Oak Woodland
The Fire Managed Oak Woodland state results from managing woodland communities on exposed aspects in States 2 or 3 with prescribed fire, over time. This state resembles the reference state, with younger maximum tree ages and lower ground flora diversity.

State 5: Grassland
Conversion of woodlands to non-native cool season grassland species such as tall fescue has been common. Low available water, abundant surface fragments, low organic matter contents and soil acidity make non-native grasslands difficult to maintain in a healthy, productive state on this ecological site. Occasionally, these pastures will have scattered patches of tall, mature pine. If grazing and pasture management is discontinued, oak sprouts will occur and the site will eventually transition to State 2. Forest Stand Improvement and Tree Planting practices can hasten this process.

State 6: High-Graded / Grazed State
Timbered sites subjected to repeated, high-graded timber harvests and 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 cattle 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)
MOCKERNUT HICKORY	*Carya tomentosa*	5-10	80
SHAGBARK HICKORY	*Carya ovata*	5-10	70
POST OAK	*Quercus stellata*	5-10	70
BLACK OAK	*Quercus velutina*	20-50	80
WHITE OAK	*Quercus alba*	20-50	70
BLACK HICKORY	*Carya texana*	5-10	60
SHORTLEAF PINE	*Pinus echinata*	0-10	80

Understory

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
FLOWERING DOGWOOD	*Cornus florida*	10-20	20
COMMON SERVICEBERRY	*Amelanchier arborea*	10-20	20

Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
AROMATIC SUMAC	*Rhus aromatica*	5-20	4
LOWBUSH HUCKLEBERRY	*Vaccinium vacillans*	5-20	3
FARKLEBERRY	*Vaccinium staminium*	5-20	10

Forbs

Common Name	Botanical Name	Cover % (low-high)
SMALL LEAVED TICKTREFOIL	*Desmodium marilandicum*	5-10
PANICLELEAF TICKTREFOIL	*Desmodium paniculatum*	5-10
TRAILIING LEZPEDEZA	*Lespedeza procumbens*	5-10
SLENDER LESPEDEZA	*Lespedeza virginica*	5-10
SIDE-BEAK PENCIL FLOWER	*Stylosanthes biflora*	5-10
VIRGINIA GOAT'S RUE	*Tephrosia virginiana*	5-10
HAIRY SUNFLOWER	*Helianthus hirsutus*	5-10
ELM-LEAVED SUNFLOWER	*Solidago ulmifolia*	5-10
HOG PEANUT	*Amphicarpeaea bracteata*	5-10
FINGER COREOPSIS	*Coreopis palmata*	5-10
CALICO ASTER	*Symphyotrichum linarifolius*	5-10
LATE PURPLE ASTER	*Symphyotrichum patens*	5-10
FIELD PUSSYTOES	*Antenarria parlinii*	5-10
YELLOW FALSE GLOVE	*Aureolaria grandiflora*	5-10
ARROWLEAF VIOLET	*Viola sagittata*	5-10
HAIRY BEDSTRAW	*Galium pilosum*	5-10

Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
LITTLE BLUESTEM	*Schizachyrium scoparium*	10-20
VIRGINIA WILDRYE	*Elymus virginicus*	10-20
PROVERTY OATGRASS	*Danthonia spicata*	10-20
FUZZY SEDGE	*Carex hirsutella*	5-20
EASTERN STAR SEDGE	*Carex radiata*	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 abundant hard mast; scattered shrubs provide soft mast; native legumes provide high-quality wildlife food.
- Sedges and native cool-season grasses provide green browse.
- Post-burn areas can provide temporary bare-ground – herbaceous cover habitat important for turkey poults and quail chicks.
- Bird species associated with early-successional woodlands are Northern Bobwhite, Prairie Warbler, Field Sparrow, Blue-winged Warbler, Yellow-breasted Chat, and Brown Thrasher.
- Bird species associated with mid- to late successional woodlands are Indigo Bunting, Red-headed Woodpecker, Eastern Bluebird, Northern Bobwhite, Summer Tanager, Eastern Wood-Pewee, Whip-poor-will, Chuck-will's widow, Red-eyed Vireo, Rose-breasted Grosbeak, Yellow-billed Cuckoo, and Broad-winged Hawk.
- Reptile and amphibian species associated with woodlands include ornate box turtle, northern fence lizard, five-lined skink, broad-headed skink, six-lined racerunner, flat-headed snake, rough earth snake, and timber rattlesnake.

Forestry

- Management: Field collected site index values average 64 for white oak, 65 for black oak and 70 for shortleaf pine. Timber management opportunities are good. 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 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, and should be used with caution on a particular site if timber management is the primary objective. Favor white oak, black oak, and shortleaf pine

- Limitations: Large amounts of coarse fragments throughout profile; bedrock may be within 60 inches. Surface stones and rocks are problems for efficient and safe equipment operation and will make equipment use somewhat difficult. Disturbing the surface excessively in harvesting operations and building roads increases soil losses, which leaves a greater amount of coarse fragments on the surface. Hand planting or direct seeding may be necessary. Seedling mortality due to low available water capacity may be high. Mulching or providing shade can improve seedling survival. Mechanical tree planting will be limited. 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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