Ecological Site Description

Chert Exposed Backslope Woodland F116BY032MO

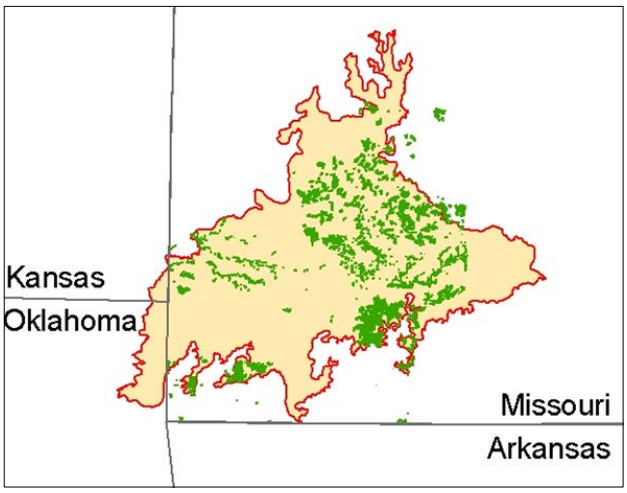
- *(Quercus velutina - Quercus alba/Rhus aromatica/Carex - Schizachyrium scoparium*)
- (black oak – white oak/aromatic sumac/sedge – little bluestem)

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: 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.

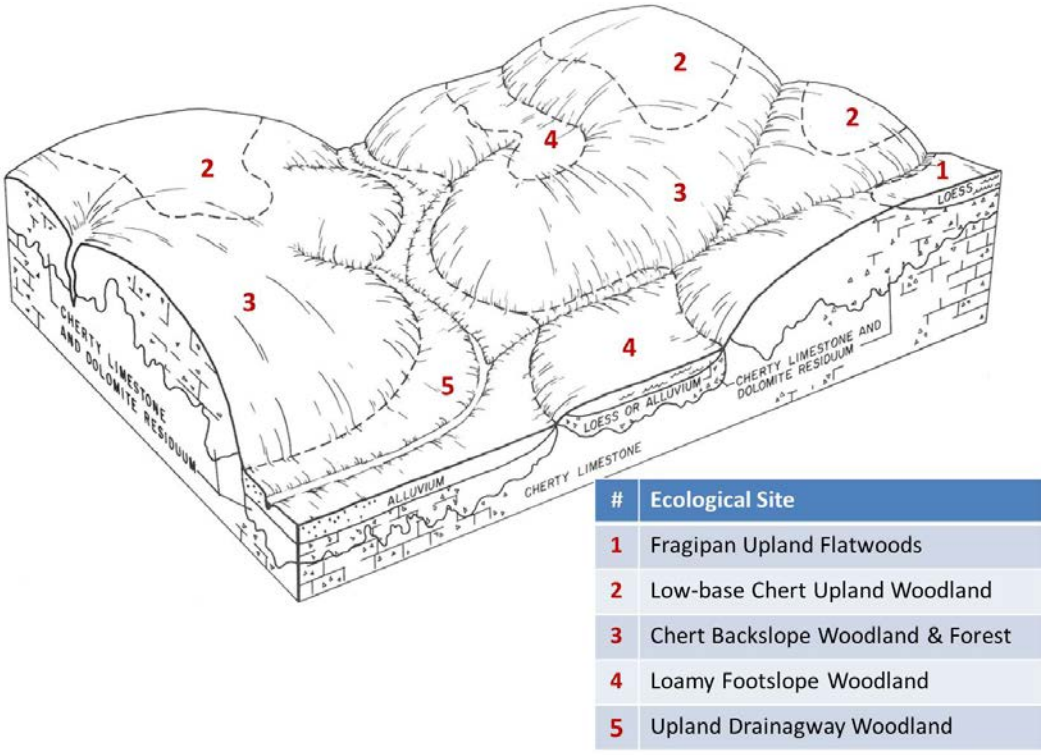


Chert Exposed Backslope Woodlands (green areas on the map) occur on steep backslopes with southern and western aspects that are associated with the major stream valleys of the region, such as the Sac river valley and the upper reaches of the James River and Finley Creek. They also occur in valleys along the southern edge of the Springfield Plain, where soils are formed in the lower Mississippian limestone and into the Ordovician-aged Jefferson City Cotter formation. This site is mapped in complex with the Chert Protected Backslope Woodland ecological site. Soils are typically very deep, with an abundance of chert fragments.

Physiographic Features

This site is on upland backslopes with slopes of 15 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 Hughes, 1982) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites. Chert Exposed Backslope Woodland sites are within the area labeled “3”, on lower backslopes with southerly to westerly exposures. Chert Protected Backslope Forest sites are on the corresponding northerly to easterly exposures. Upper slopes and shoulders within the area are in the Chert Upland Woodland ecological site. Low-base Chert upland Woodland sites, labeled “2”, are often upslope on crests and shoulders.



#	Ecological Site
1	Fragipan Upland Flatwoods
2	Low-base Chert Upland Woodland
3	Chert Backslope Woodland & Forest
4	Loamy Footslope Woodland
5	Upland Drainagway Woodland

Soil Features

These soils have no rooting restriction, and subsoils are not 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 Goss and Rueter.

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 black oak and white oak. It is very similar to Chert Upland Woodlands, except that it may be slightly less dense with more afternoon sunlight cutting to the woodland floor. The canopy is moderately tall (60 to 75 feet) but more open (65 to 85 percent cover) than protected slopes and the understory is poorly developed with less structural diversity. Increased light from the open canopy causes a diversity of ground flora species to flourish. In addition, proximity to shallow soil glades and open woodlands provides additional opportunity for increased light and species diversity. 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.

Fire played an important role in the maintenance of these systems. While the upland prairies and savannas had an estimated fire frequency of 1 to 3 years, Chert Exposed Backslope Woodlands burned less frequently (estimated 5 to 20 years) and with lower intensity. 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.

Chert Exposed Backslope Woodlands were also subjected to occasional disturbances from wind and ice, as well as grazing by native large herbivores, such as bison, elk, and deer. 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 to 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 protected slopes and deeper loess covered units. Oak regeneration is typically problematic. Sugar 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.

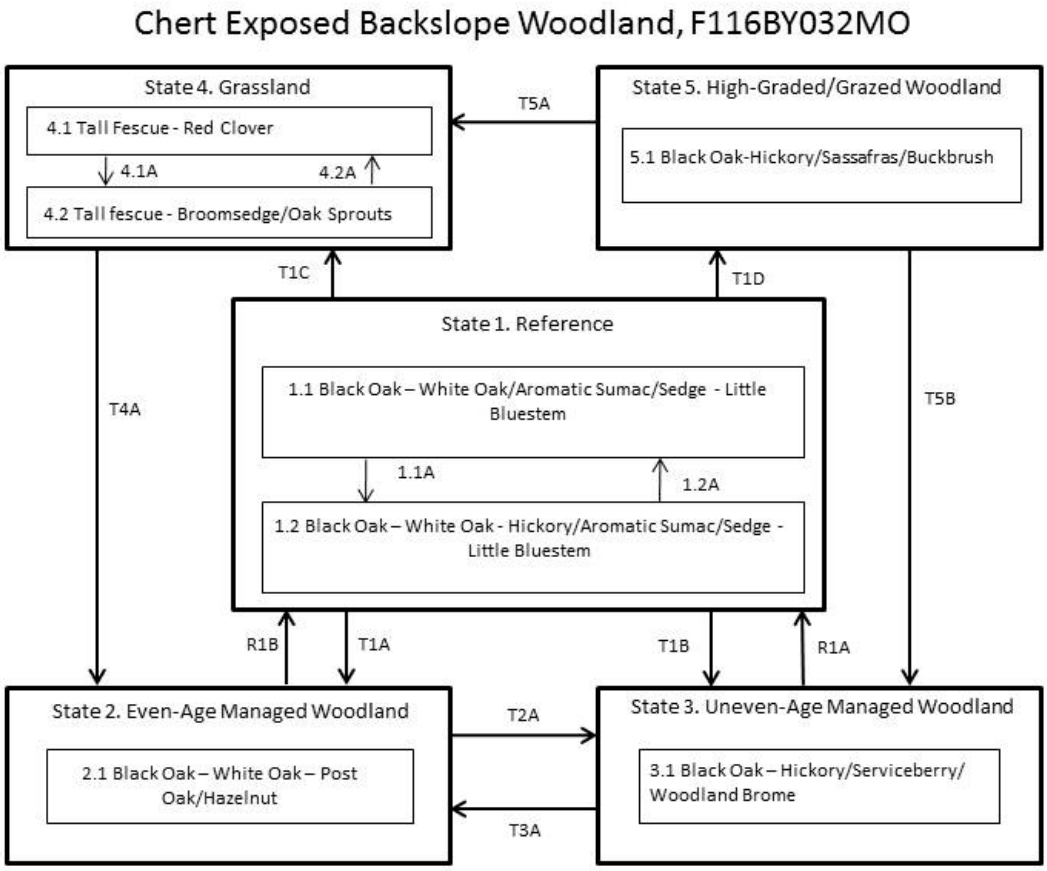
Single tree selection timber harvests are common in this region and often results in removal of the most productive trees (high grading) in the stand leading to poorer quality timber and a shift in species composition away from more valuable oak species. Better planned single tree selection or

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 periodic fires, the ground flora diversity can be shaded out and diversity of the stand may suffer.

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, post 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.

Black Oak – White Oak/Aromatic sumac/Sedge - Little Bluestem Woodland, Community Phase 1.1: The southern and western exposure limits tree density and provides enough light for abundant woodland ground flora species to persist. The tree canopy is dominated by a mixture of black, post and white oaks, and the understory is relatively open with scattered oak and sassafras saplings. This woodland community has a two-tiered structure, with a canopy that is 60 to 80 feet tall with 60 to 80 percent closure. Historically, these exposed slopes likely burned every 5 to 20 years, so ground flora cover was greater than 75 percent. During long, fire-free intervals the density of trees and saplings increased, as did fire-intolerant tree species such as hickory. Over time, these gradual species changes and increased density result in a community phase transition. Unlike the forest communities on protected slopes, the persistence of oak as a dominant canopy species is not threatened on the exposed slopes.

Black Oak – White Oak - Hickory/Aromatic Sumac/Sedge – Little Bluestem Woodland, Community Phase 1.2: This community phase may resemble forests structurally. However, the southern and western exposure limits tree density and provides enough light for woodland ground flora species to persist. The tree canopy is dominated by a dense mix of black, post and white oak, and hickory species. The understory is relatively dense, with scattered hickory, oak and sassafras saplings. This woodland community has a multi-tiered structure, and a canopy that is 60 to 80 feet tall with 80 to 100 percent closure. The dense canopy closure has suppressed the ground flora in this community. Historically, these exposed slopes likely burned every 5 to 20 years, which helped to maintain a more open canopy, increased the ground flora cover, and enabled more oak regeneration. The persistence of oak as a dominant canopy species is not threatened on the exposed slopes.

State 2: Even-Age Managed Forest

This state starts with a sequence of early seral white oak forests, which mature over time. These forests 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) forests.

State 3: Uneven-Age Managed Forest

Uneven-Age Managed forests 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 forests 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 Forest
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*	20-40	60
BLACK OAK	*Quercus velutina*	20-40	70
MOCKERNUT HICKORY	*Carya tomentosa*	10-30	60
POST OAK	*Quercus stellata*	10-30	60
SHAGBARK HICKORY	*Carya ovata*	10-20	60
SASSAFRAS	*Sassafras albidum*	10-20	40

Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
AROMATIC SUMAC	*Rhus aromatica*	10-30	5
LEADPLANT	*Amorpha canescens*	10-20	3
LOW BUSH BLUEBERRY	*Vaccinium pallidum*	10-20	2
FLOWERING DOGWOOD	*Cornus florida*	10-20	15

Forbs

Common Name	Botanical Name	Cover % (low-high)
VIRGINNIA SPIDERWORT	*Tradescantia virginiana*	5-20
WHORLED MILKWEED	*Asclepias quadrifolia*	5-20
BABY WHITE ASTER	*Symphyotrichum anomalum*	5-20
LARGE FLOWER TICK CLOVER	*Desmodium glutinosum*	5-20
ELM-LEAVED GOLDENROD	*Solidago ulmifolia*	5-20
SMALL-LEAF TICK-TREFOIL	*Desmodium marilandicum*	5-20
EASTERN BEEBALM	*Monarda bradburiana.*	5-20
PURPLE CONEFLOWER	*Echinacea purpurea*	5-20
HAIRY SUNFLOWER	*Helianthus hirsutus*	5-20
SMALL-LEAF TICK-TREFOIL	*Desmodium marilandicum*	5-20
NAKED-FLOWER TICK-TREFOIL	*Desmodium nudiflorum*	5-20
SPOTTED GERANIUM	*Geranium maculatum*	5-20
INDIAN-PHYSIC	*Gillenia stipulata*	5-20
BRISTLY BUTTERCUP	*Ranunculus hispidus*	5-20
RUE-ANEMONE	*Thalictrum thalictroides*	5-20

Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
PENNSYLVANIA SEDGE	*Carex pensylvanica*	10-30
FUZZY SEDGE	*Carex hirsutella*	10-30
WHITETINGE SEDGE	*Carex albicans*	10-30
BOSC'S PANIC GRASS	*Dichanthelium boscii*	10-30
LITTLE BLUESTEM	*Schizachyrium scoparium*	30-50
WOODLAND BROME	*Bromus pubescens*	10-30
BOTTLEBRUSH GRASS	*Elymus hystrix*	10-20

Site Interpretations

Wildlife

- Oaks provide hard mast for wildlife; scattered shrubs provide soft mast; occasional bedrock outcrops provide reptile habitat and a patchier ground flora.
- Sedges and native grasses provide green browse; native grasses on dry sites 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 Chert Woodlands include Indigo Bunting, Red-headed Woodpecker, Eastern Bluebird, Northern Bobwhite, Summer Tanager, Eastern Wood-Pewee, Whip-poor-will, Chuck-will's Widow, and Red-eyed Vireo.
- Reptiles and amphibians associated with mature Chert Woodlands include: ornate box turtle, northern fence lizard, five-lined skink, coal skink, broad-headed skink, six-lined racerunner, western slender glass lizard, prairie ring-necked snake, flat-headed snake, rough earth snake, red milk snake, western pygmy rattlesnake, and timber rattlesnake.

Forestry

- Management: Field collected site index values average 57 for shortleaf pine and 53 for black oak. Timber management opportunities are fair to 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 black oak and shortleaf pine.

- Limitations: Large amounts of coarse fragments throughout profile; 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

References

Anderson, R.C. 1990. The historic role of fire in North American grasslands. Pp. 8-18 in S.L. Collins and L.L. Wallace (eds.). Fire in North American tallgrass prairies. University of Oklahoma Press, Norman.

Batek, M.J., A.J. Rebertus, W.A. Schroeder, T.L. Haithcoat, E. Compas, and R.P. Guyette. 1999. Reconstruction of early nineteenth-century vegetation and fire regimes in the Missouri Ozarks. Journal of Biogeography 26:397-412.

Harlan, J.D., T.A. Nigh and W.A. Schroeder. 2001. The Missouri original General Land Office survey notes project. University of Missouri, Columbia.

Henderson, Richard L. 2004. Soil Survey of Cedar County, Missouri. U.S. Dept. of Agric. Natural Resources Conservation Service.

Hughes, Harold E. 1982. Soil Survey of Greene and Lawrence Counties, Missouri. U.S. Dept. of Agric. Soil Conservation Service.

Ladd, D. 1991. Reexamination of the role of fire in Missouri oak woodlands. Pp. 67-80 in G.V. Brown, James K.; Smith, Jane Kapler, eds. 2000. Wildland fire in ecosystems: effects of fire on

flora. Gen. Tech. Rep. RMRS-GTR-42-vol. 2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 257 p.

Missouri Department of Conservation. 2010. Missouri Forest and Woodland Community Profiles. Missouri Department of Conservation, Jefferson City, Missouri.

Natural Resources Conservation Service. 2002. Woodland Suitability Groups. Missouri FOTG, Section II, Soil Interpretations and Reports. 30 pgs.

Natural Resources Conservation Service. Site Index Reports. Accessed May 2014. https://esi.sc.egov.usda.gov/ESI_Forestland/pgFSWelcome.aspx

NatureServe. 2010. Vegetation Associations of Missouri (revised). NatureServe, St. Paul, Minnesota.

Nelson, Paul W. 2010. The Terrestrial Natural Communities of Missouri. Missouri Department of Conservation, Jefferson City, Missouri.

Nigh, Timothy A., & Walter A. Schroeder. 2002. Atlas of Missouri Ecoregions. Missouri Department of Conservation, Jefferson City, Missouri.

Schoolcraft, H.R. 1821. Journal of a tour into the interior of Missouri and Arkansas from Potosi, or Mine a Burton, in Missouri territory, in a southwest direction, toward the Rocky Mountains: performed in the years 1818 and 1819. Richard Phillips and Company, London.