

Ecological Site Description

Igneous Exposed Backslope Woodland

F116CY010MO

- (*Quercus alba* - *Quercus velutina*/*Sassafras albidum*/*Elymus virginicus*)
- (white oak – black oak/sassafras/Virginia wild rye)

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: 116C – St. Francois Knobs and Basins

Introduction

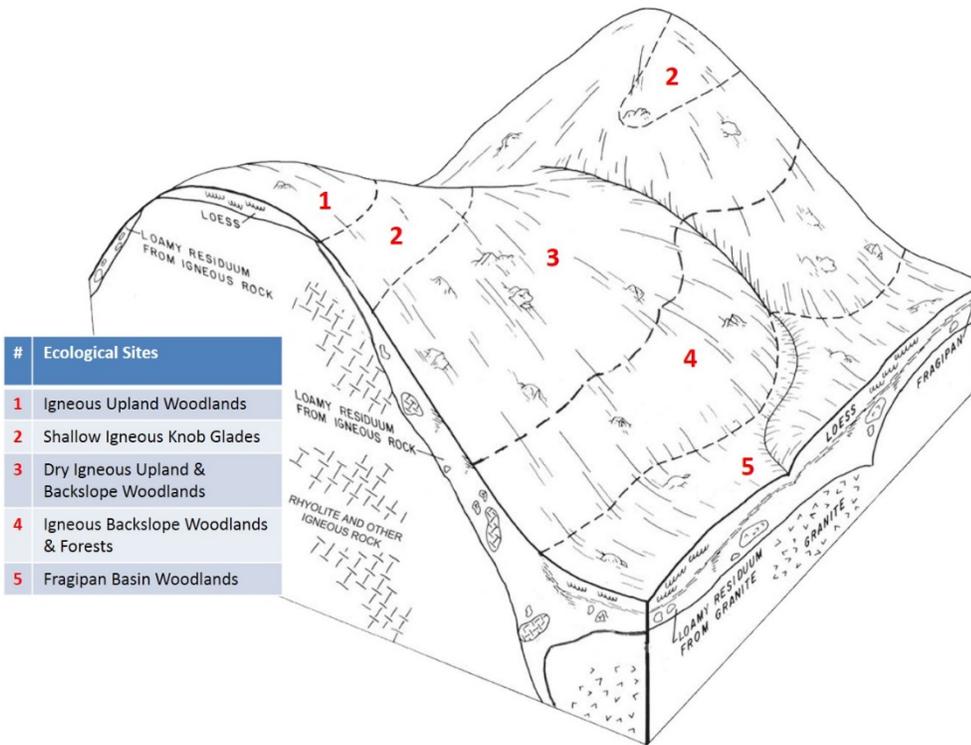
The St. Francois Knobs and Basins (area outlined in red on the map) is the structural center of the Ozark Dome. Elevation ranges from about 450 feet along the rivers in the southern part of the area, to 1,772 feet on the summit of Taum Sauk Mountain, the highest point in Missouri. Prominent features of this MLRA are the Precambrian igneous knobs and hills that rise conspicuously to various elevations, interspersed with smooth-floored basins and valleys overlying dolomite and sandstone. Ecological Sites defined for this MLRA are associated with the igneous parent materials, either in knob or basin positions. Areas influenced primarily by dolomite and/or sandstone are included in ecological sites within MLRA 116A (Ozark Highlands).



Igneous 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 Igneous Protected Backslope Forest ecological site. These sites occur throughout the area, and on outlying igneous knobs in adjacent counties. Soils are deep, with abundant volcanic rock fragments, and are low in bases. These sites are often downslope from Dry Igneous Upland Woodland ecological sites, which have root-restricting bedrock in the upper part of the soil profile, as do the upslope Shallow Igneous Knob Glade sites.

Physiographic Features

This site is on upland backslopes with slopes of 15 to 45 percent. It is on exposed aspects (south, southwest, and west), which receive significantly more 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 Simmons et al., 2006) shows the typical landscape position of this ecological site, and landscape relationships among the major ecological sites in the igneous uplands. The site is within the area labeled “4”, on the lower, steeper backslope positions.

Soil Features

These soils have acidic subsoils that are low in bases.

Some soils have a fragipan rooting barrier at about 24 inches. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is slope alluvium over residuum weathered from acid igneous rock such as granite and diorite. They have gravelly to very gravelly and cobbly silt loam surface horizons, and subsoils with moderate to high amounts of volcanic gravel and cobbles. They are not affected by seasonal wetness. Soil series associated with this site include Frenchmill, Killarney, and Mudlick.

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.

Igneous Exposed Backslope Woodlands, found on lower slopes below upland igneous knobs and dry woodlands, have a well-developed canopy (60 to 80 feet tall and 70 to 90 percent closure) dominated by white oak, black oak, shortleaf pine and scarlet oak. Compared to protected backslope forests, their overstory and understory is more open with an increase in sun loving woodland ground flora.

While the upland knobs and dry upland woodlands had an estimated fire frequency of five years, these Igneous Exposed Backslope Woodlands burned less frequently (estimated 5 to 10 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 species, especially black hickory, winged elm and eastern redcedar would have increased and the herbaceous understory diminished. The return of fire would have opened the woodlands up again and stimulated the abundant ground flora.

Igneous 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 large native herbivores would have effectively kept understory conditions more open, creating conditions more favorable to oak reproduction and sun-loving ground flora species.

In the long term absence of fire, woody species will encroach into these woodlands. This is especially true after grazing has reduced grass cover and exposed more surface to the dispersal of seeds by birds. Once established, these woodies can quickly fill the woodland system. Most of these ecological sites today are more dense and shady with a greatly diminished ground flora. Removal of the younger understory and the application of prescribed fire have proven to be effective management tools.

These sites have undergone repeated timber harvests. Most existing ecological sites have a younger (50 to 80 years) canopy whose composition has been altered by these timber harvesting practices. An increase in hickories over historic conditions is common. The absence of periodic fire has allowed more shade-tolerant tree species, such as red maple, winged elm and hickories to increase in abundance.

Today, domestic grazing is also impacting these sites, further diminishing the diversity of native plants and introducing species that are tolerant of grazing, such as buckbrush, gooseberry, and Virginia creeper along with eastern redcedar. These grazed sites also have a more open understory in addition to soil compaction, soil erosion and lower productivity problems.

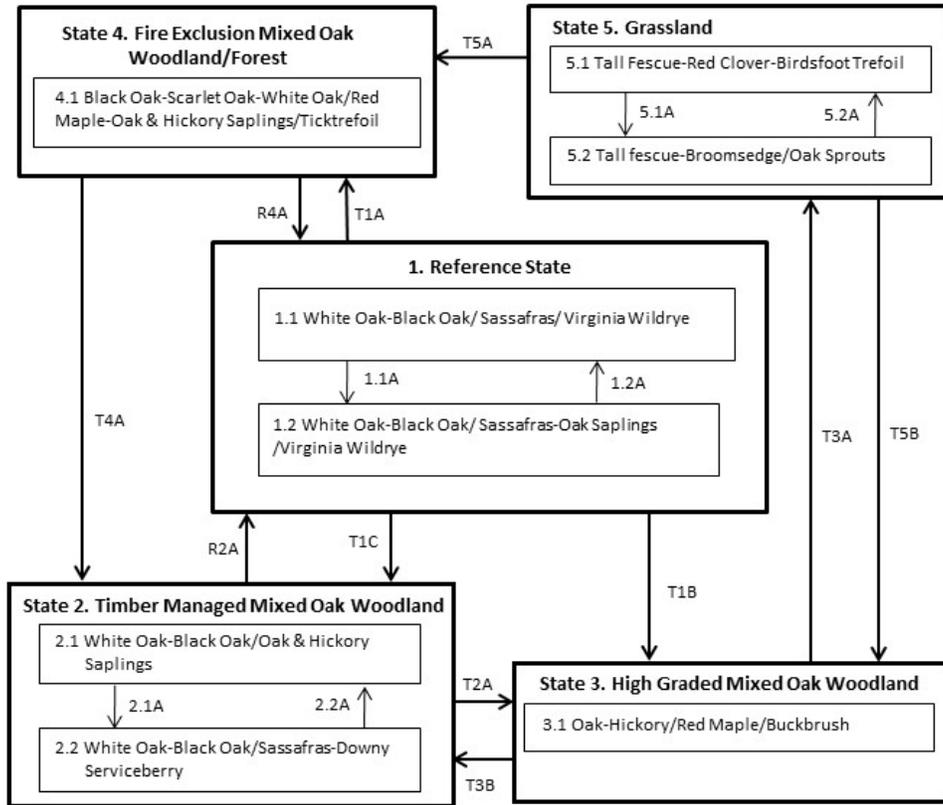
Igneous Exposed Backslope Woodlands are moderately productive timber sites. Unmanaged timber harvests in this region typically results in removal of the most productive trees, or high-grading of the stand. This can result in poorer quality residual timber and a shift in species composition away from more valuable oak species. Carefully planned single tree selection or the creation of small group openings can help regenerate more desirable oak species and increase vigor on the residual trees.

Clear-cutting also occurs 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 and the introduction of prescribed burning, the ground flora diversity can be shaded out and productivity of the stand may suffer. The higher productivity of these sites makes control of woody species somewhat more difficult. The inclusion of multiple varied igneous ecological sites in burn units can add to the habitat diversity of the landscape.

A State and Transition Diagram follows. Detailed descriptions of each state, transition, plant community, and pathway follow the model. This model is based on available experimental research,

field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.

Igneous Exposed Backslope Woodland, F116CY010MO



Code	Event/Process
T1A	Fire suppression; some logging
T1B, T2A, T5B	Logging – high grading; periodic grazing
T3A	Clearing; grassland seeding; grassland management
T1C, T4A, 2.2A	Managed forest harvesting; fire suppression
1.1A	Fire-free interval 10+ years
1.2A	Fire interval 5-10 years
2.1A	20-30 years of limited logging disturbance
5.1A	Over grazing; no fertilization
5.2A	Brush management; grassland seeding; grassland management
R2A, R4A	Selective thinning and prescribed fire interval 5-10 years
T3B	Logging cessation; selective thinning
T5A	Cessation of grazing & haying; long term succession

Ecological States

State 1 - Reference

The historical reference state for this ecological site was old growth oak woodland. This state was dominated by white oak and black oak with occasional scarlet oak, and shortleaf pine. Maximum tree age was likely 150 to 300 years. Periodic disturbances from fire, wind and ice maintained the reference 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. Reference sites are rare today.

Most of these sites have been subject to repeated, high-graded timber harvest (State 3). Fire suppression has resulted in increased canopy density, which has affected the abundance and diversity of ground flora (State 4). Relatively few igneous woodlands have been managed effectively for timber harvest (State 2), resulting in either even-age or uneven-age woodlands.

State 2 - Timber Managed Mixed Oak Woodland

Periodic timber management, along with the absence of fire, will maintain this state. Continued exclusion of prescribed fire without a regular 15 to 20 year harvest re-entry into these stands, will slowly create an increase in more shade tolerant species. White oak will become less dominant and mid-story species such as sassafras, serviceberry and hickory will become more dominant and cause a transition to community phase 2.2.

State 3 - High Graded Mixed Oak Woodland

This state is subjected to repeated, high-graded timber harvests resulting in a significant reduction in white oak densities. Fire cessation has also occurred. This state exhibits an over-abundance of black oak and hickory and other less desirable tree species, and weedy understory species such as buckbrush, gooseberry, poison ivy and Virginia creeper. The canopy is somewhat open. Some intermittent uncontrolled domestic livestock grazing may also occur further degrading the site. Proper forest management techniques and cessation of grazing can cause a transition to State 2.

State 4 - Fire Exclusion Mixed Oak Woodland/Forest

This state is dominated by black oak, scarlet oak and to a lesser extent white oak. They can form relatively even-age stands, dating to when fire suppression became the dominant management characteristic on the site. This stage can occur relatively quickly (20 to 25 years). Canopy closures can approach 80 to 90 percent with decreasing ground flora. Without active management or long term presence of fire, woody species will continue to encroach into these woodlands. Once established, these woody species can quickly fill the forest system.

Most occurrences of this state today are dense and shady with a greatly diminished ground flora. Some logging typically occurs. They are excellent wildlife sites. Removal of the younger understory, opening the upper canopy, and the application of periodic prescribed fire (5-10 years) has proven to be effective management tools in restoring the stage back to the reference state.

State 5 - Grassland

Conversion of wooded sites to planted, non-native grassland species such as tall fescue is a stage that is primarily associated with upper slope positions of this ecological site. If active grassland management is discontinued, the site will eventually transition to Phase 5.2 with an increase in broomsedge and oak sprouts and a loss of clover species. Return to the reference state from this state may be impossible requiring a very long term series of management options and stages. Many species may need to be eventually planted or reseeded to restore the system.

Studies on Ozark woodlands indicate that conversion to grassland may result in soil loss from the clearing process and from erosion before the grassland is well established. Long-term grassland

management results in higher soil pH levels and higher levels of calcium and magnesium from pasture liming. These effects may extend a foot or more into the soil profile. The effects of liming are more evident in phase 5.1 (Tall fescue – red clover – birdsfoot trefoil).

Reference State Plant Community

Canopy Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
WHITE OAK	<i>Quercus alba</i>	20-40	70
BLACK OAK	<i>Quercus velutina</i>	20-40	80
SCARLET OAK	<i>Quercus coccinea</i>	5-20	80
NORTHERN RED OAK	<i>Quercus rubra</i>	5-20	80
BLACK HICKORY	<i>Carya texana</i>	10-20	60
SHORTLEAF PINE	<i>Pinus echinata</i>	5-20	70
PIGNUT HICKORY	<i>Carya glabra</i>	5-20	60

Understory Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
SASSAFRAS	<i>Sassafras albidum</i>	10-30	30
RED MAPLE	<i>Acer rubrum</i>	5-10	40
FLOWERING DOGWOOD	<i>Cornus florida</i>	10-20	30
DOWNY SERVICEBERRY	<i>Amelanchier arborea</i>	10-20	20

Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
AROMATIC SUMAC	<i>Rhus aromatica</i>	10-30	5
LOW BUSH BLUEBERRY	<i>Vaccinium angustifolium</i>	5-20	3
ST. ANDREW'S CROSS	<i>Hypericum hypericoides</i>	5-10	4

Forbs

Common Name	Botanical Name	Cover % (low-high)
NAKED FLOWER TICKTREFOIL	<i>Desmodium nudiflorum</i>	5-10
VIOLET BUSH CLOVER	<i>Lespedeza violacae</i>	5-10
VIRGINIA THREESEED MERCURY	<i>Acalypha virginica</i>	5-10
ELM-LEAF SOLIDAGO	<i>Solidago ulmifolia</i>	5-10
LICORICE BEDSTRAW	<i>Galium circaezans</i>	5-10
DOWNY RAGGED GOLDENROD	<i>Solidago petiolares</i>	5-10
PERPLEXED TICKTREFOIL	<i>Desmodium perplexum</i>	5-10
MANYRAY ASTER	<i>Symphiotrichum anomalum</i>	5-10
TRAILING BUSH CLOVER	<i>Lespedeza procumbens</i>	5-10
HAIRY SUNFLOWER	<i>Helianthus hirsutus</i>	5-10

Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
CYPRESS PANIC GRASS	<i>Panicum dichotomum</i>	5-10
LITTLE BLUESTEM	<i>Schizachyrium scoparium</i>	10-20
ROCK MULY	<i>Muhlenbergii sobolifera</i>	5-10
WHITETINGE SEDGE	<i>Carex albicans</i>	5-10
VIRGINIA WILDRYE	<i>Elymus virginicus</i>	10-20

Site Interpretations

Wildlife

- Oaks on this site 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; 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 and herbaceous cover habitat is important for turkey poults and quail chicks.
- Birds species associated with this site 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 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: Site index values range from 50 to 55 for oak and 55 to 60 for shortleaf pine. Timber management opportunities are generally 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 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, northern red oak black oak, scarlet 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 created by cooling and crystallization of magma forming igneous rock. 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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