

## *Ecological Site Description*

### **Deep Loess Protected Backslope Forest**

**F115BY003MO**

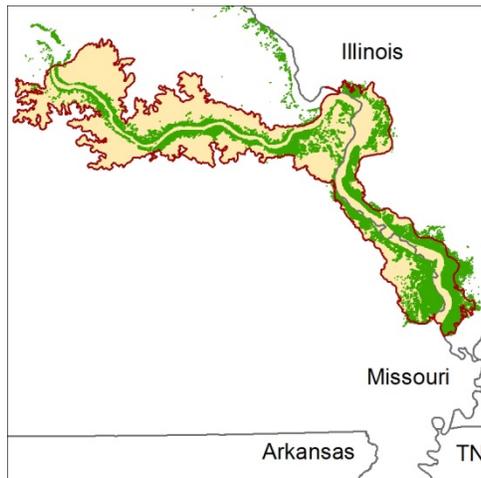
- (*Quercus rubra* - *Quercus alba*/Asimina triloba /*Laportea canadensis* - *Erigenia bulbosa*)
- (northern red oak – white oak/pawpaw /Canadian woodnettle – harbinger of spring)

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 (MLRA):** 115B – Central Mississippi Valley Wooded Slopes, Western Part

### **Introduction**

The Central Mississippi Valley Wooded Slopes, Western Part (area outlined in red on the map)



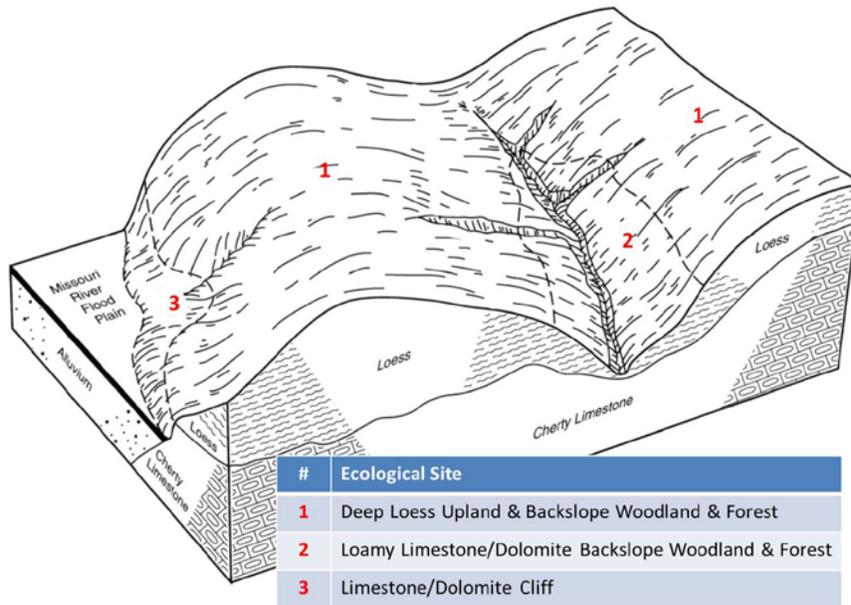
consists mainly of the deeply dissected, loess-covered hills bordering the Missouri and Mississippi Rivers as well as the floodplains and terraces of these rivers. It wraps around the northeast corner of the Ozark Uplift, and constitutes the southern border of the Pre-Illinoian-aged till plain. Elevation ranges from about 320 feet along the Mississippi River near Cape Girardeau in the south to about 1,020 feet on the highest ridges near Hillsboro, MO in the east. Local relief varies from 10 to 20 feet in the major river floodplains, to 50 to 100 feet in the dissected uplands, with bluffs of 200 to 350 feet along the Mississippi and Missouri Rivers. Underlying bedrock is mainly Ordovician-aged dolomite and sandstone, with Mississippian-aged limestone north of the Missouri River.

Deep Loess Protected Backslope Forests are within the green areas on the map. They occupy the northerly and easterly aspects of steep, dissected slopes, and are mapped in complex with the Deep Loess Exposed Backslope Woodland ecological site. These sites are adjacent to the Missouri and Mississippi River Floodplains. In some areas they occupy the entire hillslope. In other areas, Chert or Limestone/Dolomite ecological sites are on lower slopes. Upslope summit areas are typically Deep Loess Upland Woodland ecological sites. Soils are very deep, with no rooting restrictions.

### **Physiographic Features**

This site is on upland backslopes, with slopes of 15 to 60 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 Young et al., 2003) shows the typical landscape position of this ecological site, and landscape relationships with other ecological sites in the uplands adjacent to the Missouri River. The site is within the area labeled “1”, on steep backslopes with northerly and easterly aspects. Deep Loess Upland sites are directly upslope, and are included within the area labeled “1”.

**Soil Features**

These soils have no major rooting restriction. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. Parent material is loess. The soils have silt loam surface horizons. Subsoils are silt loam to silty clay loam. Some soils are slightly affected by seasonal wetness. Soil series associated with this site include Drury, Menfro, Stookey, and Winfield.

**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 a forest dominated by an overstory of northern red oak, white oak, white ash, black walnut and sugar maple. The canopy is tall (80 to 100 feet) and well developed (80 to 100 percent closure) with great structural diversity. In the most mesic landscape positions, more shade tolerant and moisture loving species, such as basswood, coffee tree, and bitternut hickory would have been in greater abundance.

While fire-prone prairies, savannas and open woodlands surround this region, Deep Loess Protected Backslope Forests historically occurred in the most protected landscape positions on lower, steep slopes in the deeper valleys furthest from the prairie uplands and would have burned less frequently

(estimated 15 to 25 years) and with lower intensity. Periodic fires would have removed some of the shade tolerant understory, but it would have quickly recovered.

Deep Loess Protected Backslope Forests would have also been subjected to occasional disturbances from wind and ice, as well as grazing by native 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. Such canopy disturbances allowed more light to reach the ground and favored reproduction of the dominant oak species. Grazing by native large herbivores would have kept understory conditions more open, also creating conditions more favorable to oak reproduction.

Today, most of these communities have been cleared and converted to pasture, or have undergone repeated timber harvest and domestic grazing. Most existing occurrences have a younger (50 to 80 years) canopy layer whose composition has been altered by timber harvesting practices. A few reference states still can be found, primary on public lands. An increase in hickories over historic conditions is common. In addition, in the absence of fire, the canopy, sub-canopy and woody understory layers are better developed. The absence of periodic fire has allowed more shade-tolerant tree species, such as sugar maple, white ash, or hickories to increase in abundance.

Current domestic grazing has diminished the diversity and amount of cover of forest ground flora species, and has introduced weedy species such as gooseberry, buckbrush, poison ivy and Virginia creeper created a more open understory and increased soil compaction.

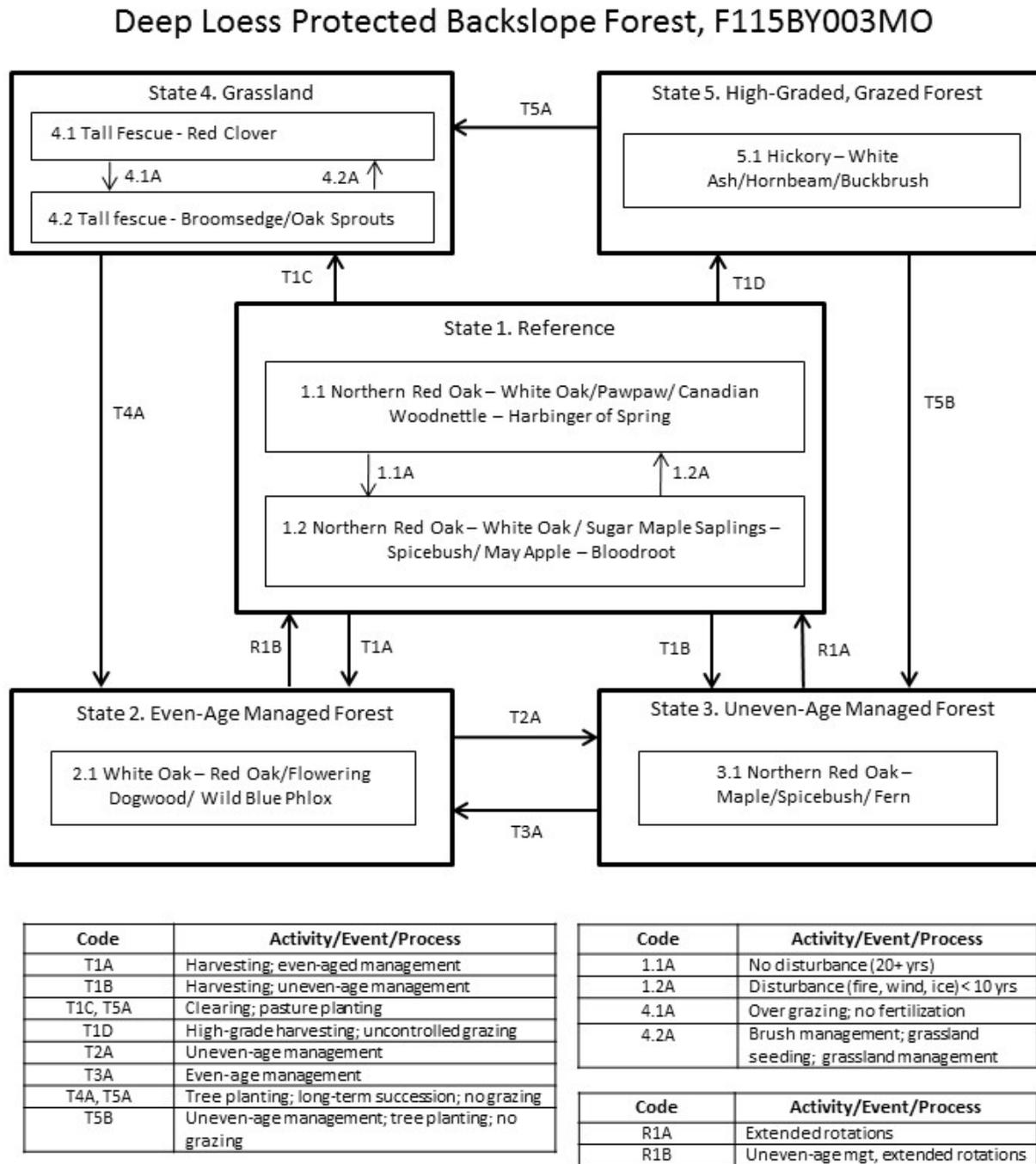
Deep Loess Protected Backslope Forests are the most productive upland timber sites in the region. Carefully planned single tree selection or the creation of small group openings can help regenerate more desirable oak species and increase vigor on the residual trees. Clear-cutting does occur and results in dense, even-aged stands of primarily oak. This may be most beneficial for existing stands whose composition has been highly altered by past management practices. However, without some thinning of the dense stands, the ground flora diversity can be shaded out and productivity of the stand may suffer.

Oak regeneration is typically problematic. Sugar maple, red elm, ironwood, hickories, grapes, pawpaw and spicebush are often dominant competitors in the understory. Maintenance of the oak component will require disturbances that will impair the cool, moist, shaded conditions, so trade-offs will have to be made carefully. Prescribed fire can play a beneficial but very limited role in the management of this ecological site.

The higher productivity of these sites makes it more challenging than on other forest sites in the region. Protected aspect forests did evolve with some fire, but their composition often reflects more closed, forested conditions, with fewer woodland ground flora species that can respond to fire. Consequently, while having protected aspects in a burn unit is acceptable, but targeting them solely for woodland restoration is not advisable.

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

**Figure 1: State and transition diagram**



## Ecological States

### State 1: Reference

The Reference State was dominated by white oak and northern red oak. Maximum tree age was likely 150 to 300 years. Periodic disturbances from fire, wind or ice maintained the dominance of white oak and no red oak by opening up the canopy and allowing more light oak reproduction. Long disturbance-free periods allowed an increase in more shade tolerant species such as basswood and sugar maple. Two community phases are recognized in this state, with shifts between phases based on disturbance frequency.

This Reference State is rare 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.

#### *Community Phase 1.1*

This community is the most productive upland forest in the MLRA. This forest community has a multi-tiered structure, and a canopy that is 75 to 100 feet tall with 80 to 100 percent closure. The sub-canopy and understory are well developed. An abundance of shade tolerant forest generalists, such as May apple, Christmas fern, tick trefoil and white snakeroot, cover the ground. In the absence of disturbance, more shade tolerant species increase such as sugar maple, basswood, white ash and others increase in importance and add structural diversity to the system. In addition, more shade-loving forest shrub (e.g., spicebush) and herbaceous (e.g., bloodroot) species also increase.

#### *Community Phase 1.2*

The overstory is a mixture of more shade tolerant species such as northern red oak, sugar maple, basswood, white ash and others. This forest community has a multi-tiered structure, and a canopy that is 75 to 100 feet tall with 90 to 100 percent closure. An abundance of shade tolerant forest generalists, such as May apple, Christmas fern, tick trefoil and white snakeroot, cover the ground. In addition, more shade-loving forest shrub (e.g., spicebush) and herbaceous (e.g., bloodroot) species are common.

### State 2: Even-Age Managed Forest

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**

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**

Forested 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 Plant Community**

## Canopy Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
WHITE OAK	<i>Quercus alba</i>	30-50	90
NORTHERN RED OAK	<i>Quercus rubra</i>	30-50	100
MOCKERNUT HICKORY	<i>Carya alba</i>	20-30	80
SUGAR MAPLE	<i>Acer saccharum</i>	5-20	80
BASSWOOD	<i>Tilia americana</i>	5-10	90
BITTERNUT HICKORY	<i>Carya cordiformis</i>	5-10	90
WHITE ASH	<i>Fraxinus americana</i>	10-20	80
RED ELM	<i>Ulmus rubra</i>	5-20	50
BLACK WALNUT	<i>Juglans nigra</i>	5-10	90

## Understory Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
HORNBEAM	<i>Ostrya virginiana</i>	5-10	30
PAWPAW	<i>Asimina triloba</i>	5-20	20
BLADDERNUT	<i>Staphylea trifolia</i>	5-10	20
FLOWERING DOGWOOD	<i>Cornus florida</i>	5-10	30

## Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
SPICEBUSH	<i>Lindera benzoin</i>	5-10	6

## Ferns

Common Name	Botanical Name	Cover % (low-high)
CHRISTMAS FERN	<i>Polystichum acrostichoides</i>	5-20
MAIDENHAIR FERN	<i>Adiantum pedatum</i>	5-20

## Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
WOODLAND SEDGE	<i>Carex blanda</i>	0-5

## Forbs

Common Name	Botanical Name	Cover % (low-high)
VIRGINIA-SNAKEROOT	<i>Aristolochia serpentaria</i>	10-20
VIRGINIA SPRINGBEAUTY	<i>Claytonia virginica</i>	10-30
DUTCHMAN'S BREECHES	<i>Dicentra cucullaria</i>	10-20
WHITE DOG'S TOOTH VIOLET	<i>Erythronium albidum</i>	10-20
SOLOMON'S SEAL	<i>Polygonatum biflorum</i>	10-20
GOLDEN SEAL	<i>Hydrastis canadensis</i>	10-20
JACK-IN-THE-PULPIT	<i>Arisaema triphyllum</i>	10-20
WILD BLUE PHLOX	<i>Phlox divaricata</i>	10-30
MAYAPPLE	<i>Podophyllum peltatum</i>	10-30
TOAD SHADE	<i>Trillium sessile</i>	10-20
BELLWORT	<i>Uvularia grandiflora</i>	10-20
WOODNETTLE	<i>Laportea canadensis</i>	10-20
GREEN DRAGON	<i>Arisaema dracontium</i>	5-10
HARBINGER OF SPRING	<i>Erigenia bulbosa</i>	10-30
WHITE BANEBERRY	<i>Actaea pachypoda</i>	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.
- Birds associated with this ecological site include Worm-eating warbler, Whip-poor-will, Great Crested Flycatcher, Ovenbird, Pileated Woodpecker, Wood Thrush, Red-eyed Vireo, Northern Parula, Louisiana Waterthrush (near streams), and Broad-winged Hawk.
- Reptile and amphibian species associated with mature forests include: ringed salamander, spotted salamander, marbled salamander, central newt, long-tailed salamander, dark-sided salamander, southern red-backed salamander, three-toed box turtle, western worm snake, western earth snake, and American toad.

*Forestry*

- **Management:** Field collected site index values average 77 for all species and 87 for northern red oak. Timber management opportunities are excellent. 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. Uneven-aged management will slowly cause an increase in more shade tolerant species such as sugar maple. 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. Where possible, favor white oak, black walnut, black cherry, and northern red oak.
- **Limitations:** No major equipment restrictions or limitations exist. Erosion is a hazard when slopes exceed 15 percent. On steep slopes greater than 35 percent, traction problems increase and equipment use is not recommended.

**Glossary**

*Backslope* – a hillslope profile position that forms the steepest and generally linear, middle portion of the slope.

*Backswamp* – marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces

*Calcareous* – the presence of calcium carbonate in the soil parent material within the rooting zone; relatively alkaline

*Claypan* – a dense, compact, slowly permeable layer in the subsoil having much higher clay content than the overlying material

*Chert* – hard, extremely dense or compact crystalline sedimentary rock, consisting dominantly of interlocking crystals of quartz

*Cliff* – a significant vertical, or near vertical, rock exposure

*Dolomite* – a type of sedimentary rock that is a carbonate mineral composed of calcium magnesium carbonate

*Drainageway* – the upper most reach of a stream channel system characterized by little meandering

*Dry* – a site where soil moisture is limiting during the growing season; low available water capacity

*Dune* – a low mound, ridge, bank or hill of loose, wind-blown sand

*Exposed* – steep, south and west-facing slopes, which are warmer and drier than other slope aspects

*Flatwoods* – a type of woodland that occurs on soils with a root restricting subsoil layer within 20 to 30 inches, resulting in very slow runoff and ponding that remains saturated for most of the winter and early spring months but dries out and becomes very dry in the summer months; plants that grow there must be adapted to both conditions

*Floodplain* – the nearly level plain that borders a stream and is subject to inundation under flood-stage conditions

*Footslope* – a hillslope position at the base of a slope where hillslope sediment (colluvium) accumulates

*Forest* – a vegetative community dominated by trees forming a closed canopy and interspersed with shade-tolerant understory species

*Fragipan* – a dense, brittle subsoil horizon that is extremely hard and compact when dry

*Glade* – open, rocky, barren vegetative community dominated by drought-adapted forbs and grasses, typically with scattered, stunted woody plants

*Igneous* – bedrock formed by cooling and solidification of magma. Granite and rhyolite are typical igneous bedrocks in Missouri

*Limestone* – a type of sedimentary rock composed largely of calcium carbonate

*Loess* – material transported and deposited by wind and consisting predominantly of silt-size particles

*Loamy* – soil material containing a relatively equal mixture of sand and silt and a somewhat smaller proportion of clay

*Marsh* – a type of wetland that is dominated by herbaceous rather than woody plant species

*Moist* – a site that is moderately well to well drained and has high available water capacity, resulting in a well-balanced supply of moisture (neither too dry nor too wet).

*Mudstone* – blocky or massive, fine-grained sedimentary rock in which the proportions of clay and silt are approximately equal

*Natric* – a soil horizon that displays a blocky, columnar, or prismatic structure and has a subhorizon with an exchangeable-sodium saturation of over 15%

*Outwash* – stratified sediments of sand and gravel removed or “washed out” from a glacier by melt-water streams

*Prairie* – a vegetative community dominated by perennial grasses and forbs with scattered shrubs and very few trees

*Protected* – steep, north- and east-facing slopes, which are cooler and moister than other slope aspects

*Residuum* - unconsolidated, weathered, or partly weathered mineral material that accumulates by disintegration of bedrock in place

*Riser* – a component of terraces and flood-plain steps consisting of the steep side slope; the escarpment

*Riverfront* – a vegetative community in the floodplain immediately adjacent and generally parallel to a river or stream channel

*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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