Ecological site F115XB020MO
Sandy/Gravelly Floodplain Forest

Accessed: 04/24/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 115X–Central Mississippi Valley Wooded Slopes

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-Illinoisan-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.

Classification relationships

Terrestrial Natural Community Type in Missouri (Nelson, 2010):
The reference state for this ecological site is most similar to a Riverfront Forest.

Missouri Department of Conservation Forest and Woodland Communities (MDC, 2006):
The reference state for this ecological site is most similar to a Riverfront Bottomland Forest.

National Vegetation Classification System Vegetation Association (NatureServe, 2010):
The reference state for this ecological site is most similar to a Betula nigra - Platanus occidentalis Forest (CEGL002086).

Geographic relationship to the Missouri Ecological Classification System (Nigh & Schroeder, 2002):
This ecological site occurs in several Land Type Associations of the following Subsections:
Mississippi River Hills
Outer Ozark Border

Ecological site concept

NOTE: This is a “provisional” Ecological Site Description (ESD) that is under development. It contains basic ecological information that can be used for conservation planning, application and land management. After additional information is collected, analyzed and reviewed, this ESD will be refined and published as “Approved”.

Sandy/Gravelly Floodplain Forests (green areas on the map) are on floodplains of secondary streams, north of the Missouri River. They are associated with Loamy Floodplain Forest ecological sites, as well as Upland Drainageway

sites. Soils are very gravelly, and subject to flooding. The reference plant community is forest with an overstory dominated by white oak and Shumard oak, an understory dominated by flowering dogwood and blue beech, and a dense herbaceous layer dominated by wild ryes and sedges.

Associated sites

F115XB007MO	**Loamy Limestone/Dolomite Upland Woodland** Loamy Limestone/Dolomite Upland Woodlands are upslope on summits from this ecological site.
F115XB014MO	**Chert Limestone/Dolomite Protected Backslope Forest** Chert Limestone/Dolomite Protected Backslope Forests are upslope on northerly and easterly aspects from this ecological site.
F115XB046MO	**Chert Limestone/Dolomite Exposed Backslope Woodland** Chert Limestone/Dolomite Exposed Backslope Forests are upslope on southerly and westerly aspects from this ecological site.
R115XB009MO	**Shallow Limestone/Dolomite Upland Glade/Woodland** Shallow Limestone/Dolomite Upland Glade/Woodlands are upslope on bedrock shelves' from this ecological site.

Similar sites

F115XB020MO	**Sandy/Gravelly Floodplain Forest** There are no similar ecological sites

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Quercus shumardii*
Shrub	(1) *Aesculus glabra*
Herbaceous	(1) *Elymus virginicus*

Physiographic features

This site is on floodplains of secondary streams with slopes of 0 to 3 percent. This ecological site is on the lowest position directly adjacent to the stream channel. The site receives some runoff from higher floodplains, stream terraces and uplands. This site is subject to frequent flooding.

The accompanying figure (adapted from Held, 1989) shows the typical landscape position of this ecological site, and landscape relationships among the major ecological sites in the adjacent uplands. The site is within the area labeled “4”, and is generally downstream from ecological sites formed in limestone.

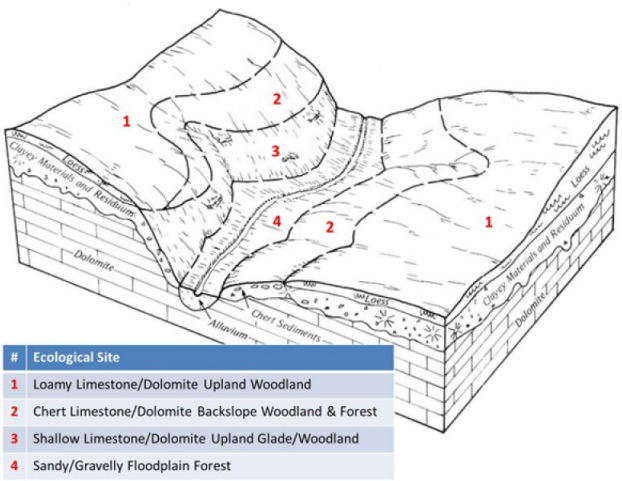


Figure 2. Landscape relationships for this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Flood plain
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Occasional to frequent
Ponding frequency	None
Slope	0–3%
Water table depth	60 in
Aspect	Aspect is not a significant factor

Climatic features

The Central Mississippi Valley Wooded Slopes, Western Part has a continental type of climate marked by strong seasonality. In winter, dry-cold air masses, unchallenged by any topographic barriers, periodically swing south from the northern plains and Canada. If they invade reasonably humid air, snowfall and rainfall result. In summer, moist, warm air masses, equally unchallenged by topographic barriers, swing north from the Gulf of Mexico and can produce abundant amounts of rain, either by fronts or by convectional processes. In some summers, high pressure stagnates over the region, creating extended droughty periods. Spring and fall are transitional seasons when abrupt changes in temperature and precipitation may occur due to successive, fast-moving fronts separating contrasting air masses.

The Central Mississippi Valley Wooded Slopes, Western Part experiences regional differences in climates, but these differences do not have obvious geographic boundaries. Regional climates grade inconspicuously into each other. The basic gradient for most climatic characteristics is along a line diagonally crossing the MLRA from northwest to southeast. Both mean annual temperature and precipitation exhibit gradients along this line.

The average annual precipitation in most of this area is 38 to 48 inches. The average annual temperature is 53 to 57 degrees F. Mean January minimum temperature follows the northwest-to-southeast gradient. However, mean July maximum temperature shows hardly any geographic variation in the MLRA. Mean July maximum temperatures have a range of only two or three degrees across the area.

Mean annual precipitation varies along the same gradient as temperature. Seasonal climatic variations are more complex. Seasonality in precipitation is very pronounced due to strong continental influences. June precipitation, for example, averages three to four times greater than January precipitation. Most of the rainfall occurs as high-intensity, convective thunderstorms in summer. Snowfall is common in winter.

During years when precipitation comes in a fairly normal manner, moisture is stored in the top layers of the soil during the winter and early spring, when evaporation and transpiration are low. During the summer months the loss of water by evaporation and transpiration is high, and if rainfall fails to occur at frequent intervals, drought will result. Drought directly affects plant and animal life by limiting water supplies, especially at times of high temperatures and high evaporation rates.

Superimposed upon the basic MLRA climatic patterns are local topographic influences that create topoclimatic, or microclimatic variations. In regions of appreciable relief, for example, air drainage at nighttime may produce temperatures several degrees lower in valley bottoms than on side slopes. At critical times during the year, this phenomenon may produce later spring or earlier fall freezes in valley bottoms. Higher daytime temperatures of bare rock surfaces and higher reflectivity of these unvegetated surfaces may create distinctive environmental niches such as glades and cliffs. Slope orientation is an important topographic influence on climate. Summits and south-and-west-facing slopes are regularly warmer and drier than adjacent north- and-east-facing slopes. Finally, the climate within a canopied forest is measurably different from the climate of a more open grassland or savanna areas.

Source: University of Missouri Climate Center - http://climate.missouri.edu/climate.php; accessed June 2012

Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin, United States Department of Agriculture Handbook 296 - http://soils.usda.gov/survey/geography/mlra/

Table 3. Representative climatic features

Frost-free period (average)	176 days
Freeze-free period (average)	201 days
Precipitation total (average)	45 in

Climate stations used

- (1) COLUMBIA U OF M [USC00231801], Columbia, MO
- (2) FULTON [USC00233079], Fulton, MO
- (3) BOWLING GREEN 1 E [USC00230856], Bowling Green, MO
- (4) ST LOUIS SPRT OF S L AP [USW00003966], Chesterfield, MO

Influencing water features

This ecological site is typically in natural levee positions directly adjacent to a perennial stream. Stream levels typically respond quickly to storm events, especially in watersheds where surface runoff is dominant. Short- to medium- duration flooding is common in many areas, particularly during spring and early summer storm events. Constructed levees, often accompanied by stream channelization, have altered the hydrology and flooding dynamics in many places.

This site is in the RIVERINE class of the Hydrogeomorphic (HGM) classification system (Brinson, 1993). The stream hydrograph drives the inflows and outflows of RIVERINE wetlands. Water moves into floodplain wetlands as surface water during flood stage, or as groundwater exchange from the stream channel to the floodplain during high flow stages. As the flood stage recedes, surface and groundwater return to the channel. The direction of movement is horizontal. The direction is also bi-directional in the lateral axis across the floodplain, but is uni-directional on the longitudinal axis parallel to the valley as water flows downhill along the valley gradient. In floodplains with high permeability sands and gravels, the volume of flow in the lateral and longitudinal directions is quite large, and can exceed the volume of stream flow in the active channel.

Soil features

These soils have low plant-available water capacity, due to an abundance of coarse fragments. They were formed under forest vegetation, with periodic depositional flood events. Organic matter content is variable. Parent material is alluvium. They have loam or silt loam surface horizons that are typically gravelly to very gravelly, and skeletal subsoils. They are not affected by seasonal wetness. Soil series associated with this site include Cedargap.

The accompanying picture of the Cedargap series shows the abundant gravel and cobble content that characterizes these skeletal soils. Scale is in feet. Picture courtesy of John Preston, NRCS.

Figure 7. Cedargap series

Table 4. Representative soil features

Surface texture	(1) Very gravelly sandy loam (2) Gravelly loam (3) Silt loam
Family particle size	(1) Sandy
Drainage class	Well drained to excessively drained
Permeability class	Slow to moderately rapid
Soil depth	72 in
Surface fragment cover <=3"	0–75%
Surface fragment cover >3"	0–2%
Available water capacity (0-40in)	1–6 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	20–75%
Subsurface fragment volume >3" (Depth not specified)	0–5%

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.

Because many of the streams associated with this ecological site are relatively high gradient, they have a rather flashy flood regime and movement and deposition of coarse alluvial materials is common. They are well drained and drier, supporting a wide variety of hardwood trees.

The reference community is a well-developed forest with a rather tall, developed canopy (60 to 80 feet tall and 80 to 100 percent canopy closure), a complex understory and a dense herbaceous ground flora. Gaps in all three layers are common due to flash flooding. White oak and Shumard oak dominate along with a variety of mixed hardwood tree species, including northern red oak, elm and hickory. Flowering dogwood, Ohio buckeye and blue beech form a well-developed understory with a dense herbaceous layer dominated by wild ryes and sedges.

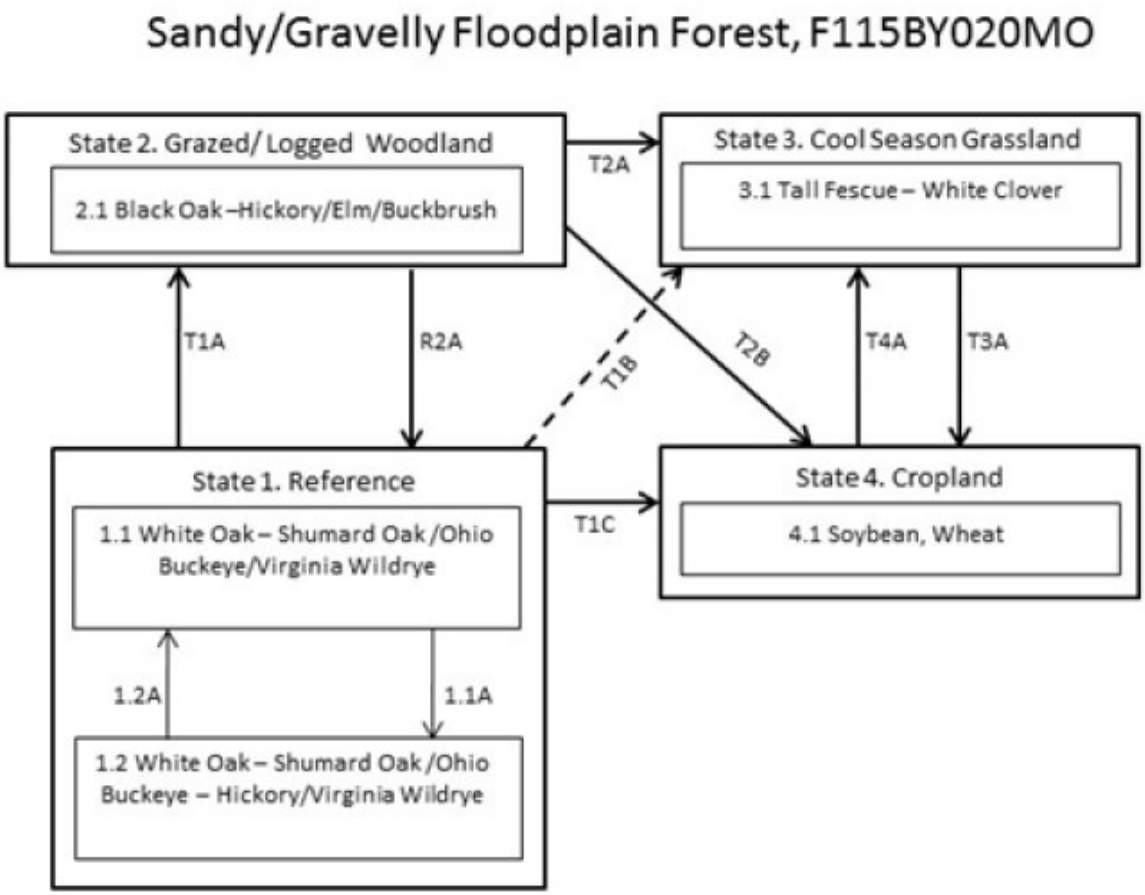
Because of the rather narrow floodplain setting, frequent flooding and rather droughty soils, many of these forests remain. They often occur as a rather narrow band of timber traversing the secondary streams.

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 can be a problem and lower productivity.

Some carefully planned timber harvest can be tolerated by this system, but high grading of the timber will degrade the system. Re-establishment of these drainageway forests is important for stream quality and health, as well as for migratory birds. Replanting of these systems has proven to be quite successful, but species selection needs to pay attention to local soil and moisture conditions.

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.

State and transition model



Code	Event/Activity/Process
T1A	Grazing; repeated timber harvests
T3A	Tillage; conservation cropping system
T1B,T2A	Woody removal; tillage; vegetative seeding; grassland management
T1C, T2B	Woody removal; tillage; conservation cropping system
T4A	Vegetative seeding ; grassland management
1.1A	Lack of disturbance events 10+ years
1.2A	Disturbance events 2-5 years
R2A	Forest stand improvement

Figure 8. State and transition diagram for this ecological s

State 1

Reference

The historical reference state for this ecological site was old growth oak forest. The forest was dominated by a wide variety of deciduous hardwood tree species including white oak and Shumard oak. Maximum tree age was likely 150 to 300 years. Periodic disturbances from flooding, fire, wind or ice as well as grazing by native large herbivores maintained the forest 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 states are very rare today. Fire suppression and altered drainage have resulted in increased canopy density, which has affected the abundance and diversity of ground flora. Most reference states are currently altered because of timber harvesting, clearing and conversion to grassland or cropland.

Community 1.1
White Oak – Shumard Oak /Ohio Buckeye/Virginia Wildrye

This phase supports a wide variety of hardwood trees that is a well-developed forest with a complex understory and a dense herbaceous ground flora. Gaps in all three layers are common due to flash flooding.

Forest overstory. The Overstory Species list is based on field surveys and commonly occurring species listed in Nelson (2010).

Forest understory. The Understory Species list is based on field surveys and commonly occurring species listed in Nelson (2010).

Community 1.2
White Oak – Shumard Oak /Ohio Buckeye - Hickory/Virginia Wildrye

This phase has a decrease in periodic disturbances including flooding, ice and wind reducing canopy gaps, allowing more shade tolerant species to successfully reproduce and move into the canopy.

State 2
Grazed/ Logged Forest

Composition is altered from the reference state depending on tree selection during harvest. This state will slowly increase in more shade tolerant species and white oak will become less dominant. Without periodic canopy disturbance, stem density and fire intolerant species, like elm, will increase in abundance. Some periodic grazing may be occurring.

Community 2.1
Black Oak –Hickory/Elm/Buckbrush

Due to high-grade logging and uncontrolled grazing, this community phase exhibits an over-abundance of hickory and other less economically desirable tree species and weedy understory species such as buckbrush, gooseberry, poison ivy and multi-flora rose. The understory vegetation offers little nutritional value for cattle, and excessive livestock stocking damages tree boles, degrades understory species composition and results in soil compaction and accelerated erosion and runoff.

State 3
Cool Season Grassland

Conversion of other states to non-native cool season species such as tall fescue, orchard grass, and red clover has been common. Occasionally, these pastures will have scattered oaks. Long term uncontrolled grazing can cause significant soil erosion and compaction. A return to the reference state may be impossible, requiring a very long term series of management options and transitions.

Community 3.1
Tall Fescue – White Clover

This phase is well managed grassland, composed of non-native cool season grasses and legumes. Grazing and haying is occurring. The effects of long-term liming on soil pH, and calcium and magnesium content, is most evident in this phase. Studies show that these soils have higher pH and higher base status in soil horizons as much as two feet below the surface, relative to poorly managed grassland and to woodland communities (where liming is not practiced).

State 4
Cropland

This is a state that exists currently with intensive cropping of soybeans and wheat. Some conversion to cool season hay land occurs, but when commodity prices are high, these states transition back to cropland.

Community 4.1
Soybean, Wheat

This is the only phase in this state at this time. See the corresponding state narrative for details.

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
white oak	QUAL	*Quercus alba*	Native	–	–	–	–
northern red oak	QURU	*Quercus rubra*	Native	–	–	–	–
shagbark hickory	CAOV2	*Carya ovata*	Native	–	–	–	–
American elm	ULAM	*Ulmus americana*	Native	–	–	–	–
mockernut hickory	CATO6	*Carya tomentosa*	Native	–	–	–	–
black oak	QUVE	*Quercus velutina*	Native	–	–	–	–
Shumard's oak	QUSH	*Quercus shumardii*	Native	–	–	–	–
slippery elm	ULRU	*Ulmus rubra*	Native	–	–	–	–
American sycamore	PLOC	*Platanus occidentalis*	Native	–	–	–	–
sugar maple	ACSA3	*Acer saccharum*	Native	–	–	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
hairy woodland brome	BRPU6	*Bromus pubescens*	Native	–	–
Indian woodoats	CHLA5	*Chasmanthium latifolium*	Native	–	–
parasol sedge	CAUM4	*Carex umbellata*	Native	–	–
Virginia wildrye	ELVI3	*Elymus virginicus*	Native	–	–
eastern bottlebrush grass	ELHY	*Elymus hystrix*	Native	–	–
Bosc's panicgrass	DIBO2	*Dichanthelium boscii*	Native	–	–
Pennsylvania sedge	CAPE6	*Carex pensylvanica*	Native	–	–
Forb/Herb					
American lopseed	PHLE5	*Phryma leptostachya*	Native	–	–
Canadian wildginger	ASCA	*Asarum canadense*	Native	–	–
American bellflower	CAAM18	*Campanulastrum americanum*	Native	–	–
carpenter's square	SCMA2	*Scrophularia marilandica*	Native	–	–
Carolina elephantsfoot	ELCA3	*Elephantopus carolinianus*	Native	–	–
American hogpeanut	AMBR2	*Amphicarpaea bracteata*	Native	–	–
Jack in the pulpit	ARTR	*Arisaema triphyllum*	Native	–	–
pointedleaf ticktrefoil	DEGL5	*Desmodium glutinosum*	Native	–	–
Canadian blacksnakeroot	SACA15	*Sanicula canadensis*	Native	–	–
heartleaf skullcap	SCOV	*Scutellaria ovata*	Native	–	–
stinging nettle	URDI	*Urtica dioica*	Native	–	–
three-lobe violet	VITR2	*Viola triloba*	Native	–	–
Fern/fern ally					
rattlesnake fern	BOVI	*Botrychium virginianum*	Native	–	–
Shrub/Subshrub					
American hazelnut	COAM3	*Corylus americana*	Native	–	–
northern spicebush	LIBE3	*Lindera benzoin*	Native	–	–
Tree					
Ohio buckeye	AEGL	*Aesculus glabra*	Native	–	–
flowering dogwood	COFL2	*Cornus florida*	Native	–	–
American hornbeam	CACA18	*Carpinus caroliniana*	Native	–	–
Vine/Liana					
eastern poison ivy	TORA2	*Toxicodendron radicans*	Native	–	–
Virginia creeper	PAQU2	*Parthenocissus quinquefolia*	Native	–	–
heartleaf peppervine	AMCO2	*Ampelopsis cordata*	Native	–	–

Animal community

Wildlife (MDC 2006):

Hard mast from the oaks, soft mast from shrubs, high nutrition seeds and forage is abundant in this community.

Tall emergent trees along with an uneven canopy structure and canopy gaps are important for heron colonies, eagle nesting, Mississippi kites, cerulean warblers and other bird species and are important migratory songbird stopover sites.

Birds associated with late-successional forests include: Red-headed Woodpecker, Indigo Bunting, Yellow Warbler, Eastern Wood-Pewee, Great Crested Flycatcher, Tree Swallow, Orchard Oriole, and Baltimore Oriole

Reptile and amphibian species include tiger salamander, small-mouthed salamander, midland brown snake, gray tree frog, plains leopard frog, southern leopard frog, and western chorus frog.

Other information

Forestry (NRCS 2002, 2014):

Management: Field collected site index values average 90 for sycamore and 66 for black oak. Timber management opportunities are moderate. Create group openings of at least 2 acres. Large clearcuts should be minimized if possible to reduce impacts on wildlife and aesthetics. Uneven-aged management using single tree selection or small group selection cuttings of ½ to 1 acre are other options that can be used if clear cutting is not desired or warranted. Maintain adequate riparian buffer areas.

Limitations: Wetness from flooding – short duration; coarse fragments in profile; excessive drainage. The use of equipment may be restricted in spring and other excessively wet periods. Disturbing the surface excessively in harvesting operations and building roads increases soil losses, which may leave a greater amount of coarse fragments on the surface. Tree planting is difficult during spring flooding periods. Mechanical tree planting may be limited due to coarse fragments on surface.

Inventory data references

Sandy/Gravelly Floodplain Forest – Potential Reference (phase 1.2) – F115BY020MO

Plot DANVCA_JK10 – Cedargap soil
Located in Danville CA, Montgomery County, MO
Latitude: 38.871726
Longitude: -91.50645523

Plot LILOCA_JK17 - Cedargap soil
Located in Little Lost Creek CA, Warren County, MO
Latitude: 38.771285
Longitude: -91.27392

Other references

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Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin, United States Department of Agriculture Handbook 296 - http://soils.usda.gov/survey/geography/mlra/

Contributors

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Doug Wallace

Acknowledgments

Missouri Department of Conservation and Missouri Department of Natural Resources personnel provided significant and helpful field and technical support in the development of this ecological site.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

   _____

2. **Presence of water flow patterns:**

   _____

3. **Number and height of erosional pedestals or terracettes:**

   _____

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

   _____

5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if**

their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:

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17. **Perennial plant reproductive capability:**
