Ecological site R115XC017IL
Floodplain Prairie

Last updated: 12/30/2024
Accessed: 01/09/2025

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.

MLRA notes

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

This MLRA is characterized by deeply dissected, loess-covered hills bordering well defined valleys of the Illinois, Mississippi, Missouri, Ohio, and Wabash Rivers and their tributaries. It is used to produce cash crops and livestock. About one-third of the area is forested, mostly on the steeper slopes. This area is in Illinois (50 percent), Missouri (36 percent), Indiana (13 percent), and Iowa (1 percent) in two separate areas. It makes up about 25,084 square miles (64,967 square kilometers).

Most of this area is in the Till Plains section and the Dissected Till Plains section of the Central Lowland province of the Interior Plains. The Springfield-Salem plateaus section of the Ozarks Plateaus province of the Interior Highlands occurs along the Missouri River and the Mississippi River south of the confluence with the Missouri River. The nearly level to very steep uplands are dissected by both large and small tributaries of the Illinois, Mississippi, Missouri, Ohio, and Wabash Rivers. The Ohio River flows along the southernmost boundary of this area in Indiana. Well defined valleys with broad flood plains and numerous stream terraces are along the major streams and rivers. The flood plains along the smaller streams are narrow. Broad summits are nearly level to undulating. Karst topography is common in some parts along the Missouri and Mississippi Rivers and their tributaries. Well-developed karst areas have hundreds of sinkholes, caves, springs, and losing streams. In the St. Louis area, many of the karst features have been obliterated by urban development.

Elevation ranges from 90 feet (20 meters) on the southernmost flood plains to 1,030 feet (320 meters) on the highest ridges. Local relief is mainly 10 to 50 feet (3 to 15 meters) but can be 50 to 150 feet (15 to 45 meters) in the steep, deeply dissected hills bordering rivers and streams. The bluffs along the major rivers are generally 200 to 350 feet (60 to 105 meters) above the valley floor.

The uplands in this MLRA are covered almost entirely with Peoria Loess. The loess can be more than 7 feet (2 meters) thick on stable summits. On the steeper slopes, it is thin or does not occur. In Illinois, the loess is underlain mostly by Illinoian-age till that commonly contains a paleosol. Pre-Illinoian-age till is in parts of this MLRA in Iowa and Missouri and to a minor extent in the western part of Illinois. Wisconsin-age outwash, alluvial deposits, and sandy eolian material are on some of the stream terraces and on dunes along the major tributaries. The loess and glacial deposits are underlain by several bedrock systems. Pennsylvanian and Mississippian bedrock are the most extensive. To a lesser extent are Silurian, Devonian, Cretaceous, and Ordovician bedrock. Karst areas have formed where limestone is near the surface, mostly in the southern part of the MLRA along the Mississippi River and some of its major tributaries. Bedrock outcrops are common on the bluffs along the Mississippi, Ohio, and Wabash Rivers and their major tributaries and at the base of some steep slopes along minor streams and drainageways.

The annual precipitation ranges from 35 to 49 inches (880 to 1,250 millimeters) with a mean of 41 inches (1,050 millimeters). The annual temperature ranges from 48 to 58 degrees F (8.6 to 14.3 degrees C) with a mean of 54 degrees F (12.3 degrees C). The freeze-free period ranges from 150 to 220 days with a mean of 195 days.

Soils The dominant soil orders are Alfisols and, to a lesser extent, Entisols and Mollisols. The soils in the area have a mesic soil temperature regime, an aquic or udic soil moisture regime, and mixed or smectitic mineralogy. They are shallow to very deep, excessively drained to poorly drained, and loamy, silty, or clayey.

The soils on uplands in this area support natural hardwoods. Oak, hickory, and sugar maple are the dominant species. Big bluestem, little bluestem, and scattered oak and eastern redcedar grow on some sites. The soils on flood plains support mixed forest vegetation, mainly American elm, eastern cottonwood, river birch, green ash, silver maple, sweetgum, American sycamore, pin oak, pecan, and willow. Sedge and grass meadows and scattered trees are on some low-lying sites. (United States Department of Agriculture, Natural Resources Conservation Service, 2022)

LRU notes

The Central Mississippi Valley Wooded Slopes, Northern part (Land Resource Unit (LRU) 115XC) encompasses the Wyaconda River Dissected Till Plains, Mississippi River Hills, and Mississippi River Alluvial Plain (Schwegman et al. 1973; Nelson 2010). It spans three states – Illinois (73 percent), Iowa (6 percent), and Missouri (21 percent) – comprising about 13,650 square miles (Figure 1). The elevation ranges from 420 feet above sea level (ASL) along the Mississippi River floodplains to 885 feet on the upland ridges. Local relief varies from 10 to 20 feet but can be as high as 50 to 100 feet along drainageways and streams and the bluffs on the major rivers reaching 250 feet above valley floors. Wisconsin-aged loess covers the uplands, while Illinoian glacial drift lies directly below. The loess and drift deposits are underlain by several bedrock systems, including the Cretaceous, Pennsylvania, Mississippian, Silurian, Devonian, and Ordovician Systems. Wisconsin outwash deposits and sandy eolian material occur along stream terraces of major tributaries (USDA-NRCS 2006).

The vegetation across the region has undergone drastic changes over time. At the end of the last glacial episode – the Wisconsinan glaciation – the evolution of vegetation began with the development of tundra habitats, followed by a phase of spruce and fir forests, and eventually spruce-pine forests. Not until approximately 9,000 years ago did the climate undergo a warming trend which prompted the development of deciduous forests dominated by oak and hickory. As the climate continued to warm and dry, prairies began to develop approximately 8,300 years ago. Another shift in climate that resulted in an increase in moisture prompted the emergence of savanna-like habitats from 8,000 to 5,000 years before present (Taft et al. 2009). During the most recent climatic shifts, forested ecosystems maintained footholds on steep valley sides and wet floodplains. Due to the physiography of the MLRA, forests were the dominant ecosystems and were affected by such natural disturbances as droughts, wind, lightning, and occasional fire (Taft et al. 2009).

Classification relationships

USFS Subregions: Central Dissected Till Plains (251C)Section; Western Mississippi River Hills (251Ce), Mississippi River and Illinois Alluvial Plains (251Cf), Eastern Mississippi River Hills (251Ci), Galesburg Dissected Till Plain (251Cj), and Wyaconda River Dissected Till Plain (251Cm) Subsections (Cleland et al. 2007)

U.S. EPA Level IV Ecoregion: Upper Mississippi River Alluvial Plain (72d), River Hills (72f), and Western Dissected Illinoian Till Plain (72i) (USEPA 2013)

National Vegetation Classification – Ecological Systems: Central Tallgrass Prairie (CES205.683) (NatureServe 2015)

National Vegetation Classification - Plant Associations: Andropogon gerardii – Panicum virgatum – helianthus grosseserratus Wet Meadow (CEGL002024) (Nature Serve 2015)

Biophysical Settings: Central Tallgrass Prairie (BpS 4214210) (LANDFIRE 2009)

Natural Resources Conservation Service – Iowa Plant Community Species List: Prairie, Central Wet-Mesic Tallgrass (USDA-NRCS 2007)

Illinois Natural Areas Inventory: Wet prairie (White and Madany 1978)

Iowa Department of Natural Resources: Floodplain Prairie (INAI 1984)

Missouri Terrestrial Natural Communities: Wet-mesic bottomland prairie (Nelson 2010)

Ecological site concept

Floodplain Prairies are located within the green areas on the map. They occur on floodplains in river valleys. The soils are Entisols that are somewhat poorly drained and very deep, formed in alluvium.

The historic pre-European settlement vegetation on this ecological site was dominated by mesic and wet-mesic tallgrass prairie vegetation. Bluejoint (Calamagrostis canadensis (Michx.) P. Beauv.) and big bluestem (Andropogon gerardii Vitman) are the dominant species on Floodplain Prairies. Other grasses that may occur include prairie cordgrass (Spartina pectinata Bosc ex Link), switchgrass (Panicum virgatum L.), and Indiangrass (Sorghastrum nutans (L.) Nash) (NatureServe 2018). Forbs typical of an undisturbed plant community associated with this ecological site may include button eryngo (Eryngium yuccifolium Michx.) and fourflower yellow loosestrife (Lysimachia quadriflora Sims) (Drobney et al. 2001; NatureServe 2018). Periodic fire and occasional flooding are the primary disturbance factors that maintain this site, while drought and native mammal grazing are secondary factors (LANDFIRE 2009; NatureServe 2018).

Associated sites

R115XC018IL	**Wet Floodplain Sedge Meadow** Alluvial parent materials that are shallow to a high-water table including Ambraw, Beaucoup, Birds, Blackoar, Calco, Caneek, Comfrey, Darwin, Gorham, Millington, Okaw, Otter, Petrolia, Quiver, Sawmill, Sepo, Toolesboro, Vesser, and Zook soils

Similar sites

R115XC002IL	**Loess Upland Prairie** Loess Upland Prairies occur on uplands and are not subject to flooding

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Calamagrostis canadensis* (2) *Andropogon gerardii*

Physiographic features

Floodplain Prairies occur on floodplains in river valleys. They are situated on elevations ranging from approximately 341 to 1020 feet ASL. The site experiences rare to occasional flooding that can last up to 7 days.

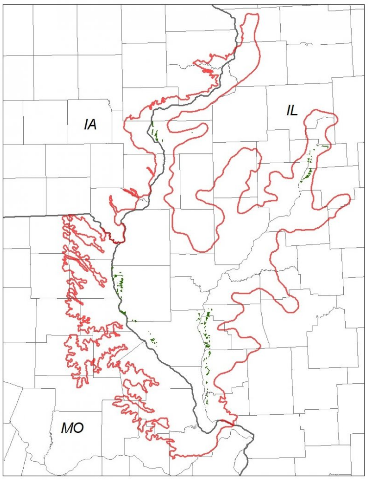


Figure 1. Location of Floodplain Prairie ecological site within LRU 115XC.

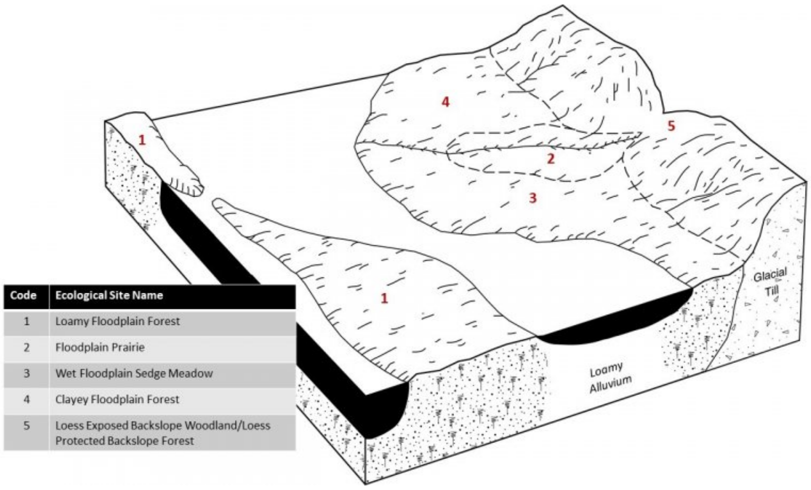


Figure 2. Representative block diagram of Floodplain Prairie and associated ecological sites.

Table 2. Representative physiographic features

Slope shape across	(1) Linear
Slope shape up-down	(1) Linear
Landforms	(1) River valley > Flood plain
Runoff class	Low
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Rare to occasional
Ponding frequency	None
Elevation	104–311 m
Slope	0–3%
Water table depth	46–203 cm
Aspect	Aspect is not a significant factor

Climatic features

The Central Mississippi Valley Wooded Slopes, Northern Part falls into the humid subtropical (Cfa) and hot-summer humid continental climate (Dfa) Köppen-Geiger climate classifications (Peel et al. 2007). The two main factors that drive the climate of the MLRA are latitude and weather systems. Latitude, and the subsequent reflection of solar input, determines air temperatures and seasonal variations. Solar energy varies across the seasons, with summer receiving three to four times as much energy as opposed to winter. Weather systems (air masses and cyclonic storms) are responsible for daily fluctuations of weather conditions. High-pressure systems are responsible for settled weather patterns where sun and clear skies dominate. In fall, winter, and spring, the polar jet stream is responsible for the creation and movement of low-pressure systems. The clouds, winds, and precipitation associated with a low-pressure system regularly follow high-pressure systems every few days (Angel n.d.).

The soil temperature regime of LRU 115XC is classified as mesic, where the mean annual soil temperature is between 46 and 59°F (USDA-NRCS 2006). Temperature and precipitation occur along a north-south gradient, where temperature and precipitation increase the further south one travels. The average freeze-free period of this ecological site is about 184 days, while the frost-free period is about 152 days. The majority of the precipitation occurs as rainfall in the form of convective thunderstorms during the growing season. Average annual precipitation is 38 inches, which includes rainfall plus the water equivalent from snowfall. The average annual low and high temperatures are 42 and 62°F, respectively.

Table 3. Representative climatic features

Frost-free period (characteristic range)	141-168 days

Freeze-free period (characteristic range)	170-196 days
Precipitation total (characteristic range)	889-1,016 mm
Frost-free period (actual range)	140-170 days
Freeze-free period (actual range)	169-203 days
Precipitation total (actual range)	889-1,016 mm
Frost-free period (average)	152 days
Freeze-free period (average)	184 days
Precipitation total (average)	965 mm

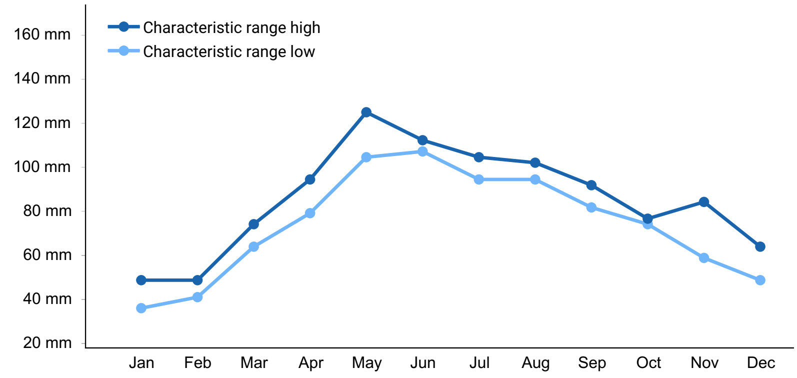


Figure 3. Monthly precipitation range

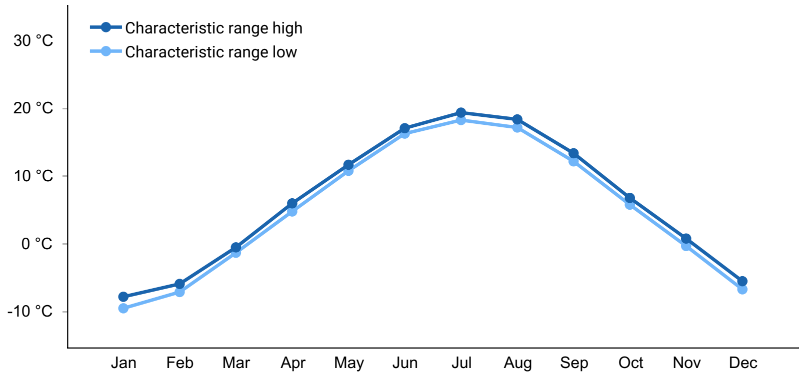


Figure 4. Monthly minimum temperature range

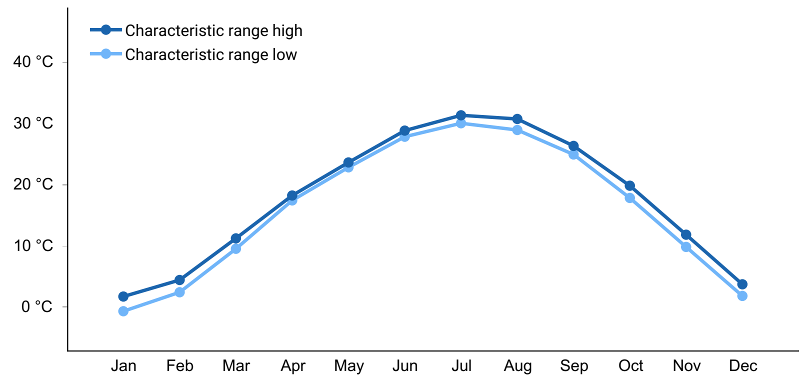


Figure 5. Monthly maximum temperature range

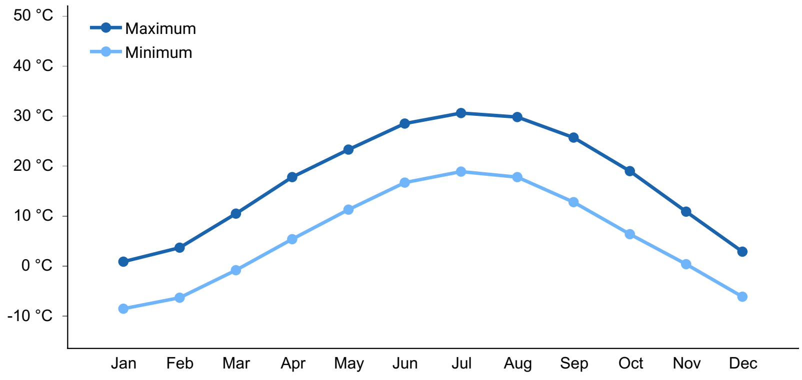


Figure 6. Monthly average minimum and maximum temperature

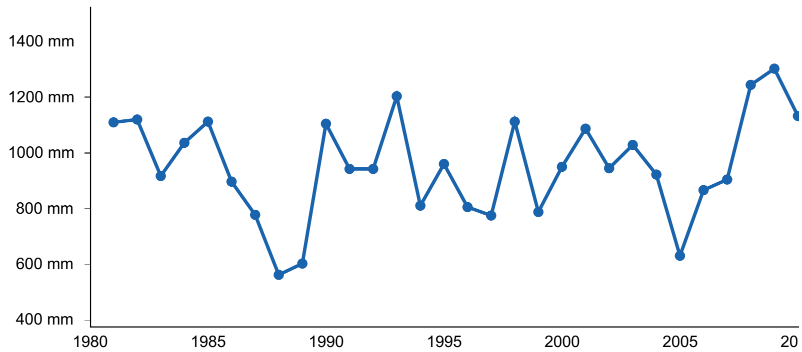


Figure 7. Annual precipitation pattern

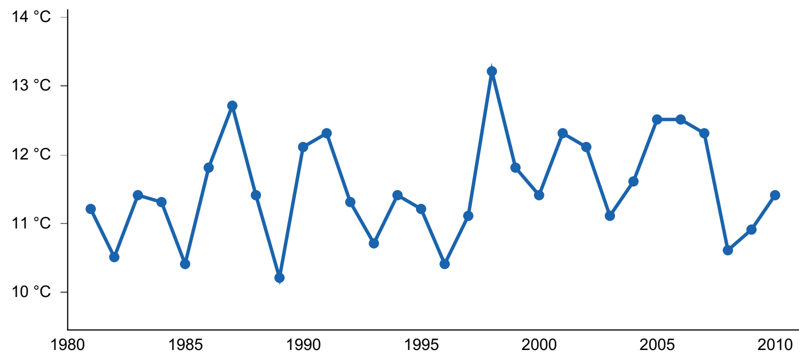


Figure 8. Annual average temperature pattern

Climate stations used

- (1) CLARKSVILLE L&D 24 [USC00231640], Clarksville, MO
- (2) HAVANA [USC00113940], Lewistown, IL
- (3) CLINTON #1 [USC00131635], Camanche, IA
- (4) NEW BOSTON DAM 17 [USC00116080], Wapello, IL
- (5) CANTON L&D 20 [USC00231275], Canton, MO

Influencing water features

Floodplain Prairies are classified as a RIVERINE: occasionally flooded, herbaceous wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008) and as a Palustrine, Persistent Emergent, Temporarily Flooded Wetland under the National Wetlands Inventory (FGDC 2013). Overbank flow from the stream and subsurface hydraulic connections are the main sources of water for this ecological site, but additional sources can include overland flow from adjacent uplands and precipitation (Smith et al. 1995). Infiltration is very slow to slow (Hydrologic Groups C and D) for undrained soils, and surface runoff is very low to low.

Wetland description

Wetland hydrology indicators may be present on undrained Floodplain prairies (e.g., A1 Surface water) but are not indicative of wetland hydrology due to the flooding frequency being less than 50 percent (USACE 2010).

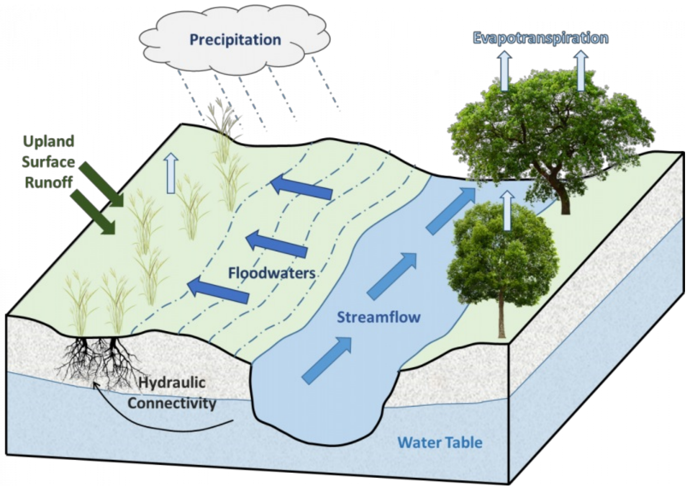


Figure 9. Hydrologic cycling in Floodplain Prairie ecological site.

Soil features

Soils of Floodplain Prairies are in the Entisols order, further classified as Aquic Udifluvents with very slow to slow infiltration and low runoff potential. The soil series associated with this site includes Dupo, Psamments, and Raveenwash. The parent material is alluvium, and the soils are somewhat poorly drained and very deep. Soil pH classes are moderately acid to moderately alkaline. No rooting restrictions are noted for the soils of this ecological site.

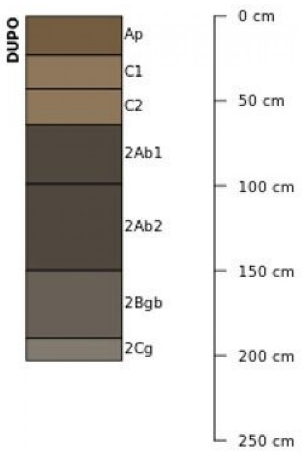


Figure 10. Profile sketches of soil series associated with Floodplain Prairie.

Table 4. Representative soil features

Parent material	(1) Alluvium
Family particle size	(1) Coarse-silty (2) Coarse-loamy
Drainage class	Somewhat poorly drained
Permeability class	Very slow to moderate
Depth to restrictive layer	203 cm
Soil depth	203 cm
Surface fragment cover <=3"	0%

Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	7.62–20.32 cm
Calcium carbonate equivalent (Depth not specified)	0–30%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–3%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The MLRA lies within the tallgrass prairie ecosystem of the Midwest, but a variety of environmental and edaphic factors resulted in a landscape that historically supported upland hardwood forests, lowland mixed forests, and scattered grass and sedge meadows. Floodplain Prairies form an aspect of this vegetative continuum. This ecological site occurs on floodplains on somewhat poorly drained soils. Species characteristic of this ecological site consist of a mix of mesic and wet-mesic tallgrass prairie vegetation.

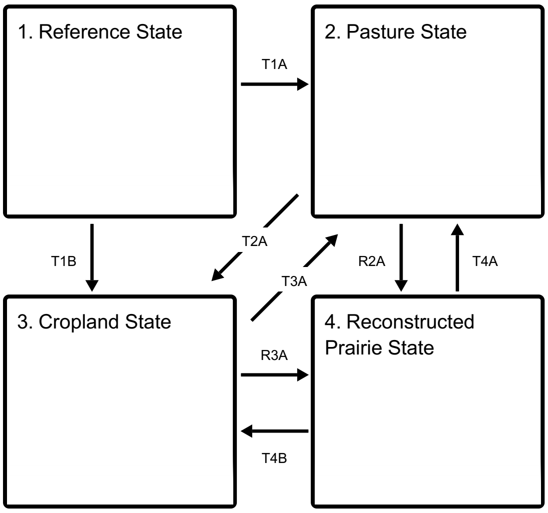
Fire and flooding are the most important ecosystem drivers for maintaining this ecological site. Fire intensity typically consisted of periodic, low-intensity surface fires occurring every 1 to 3 years (LANDFIRE 2009). Ignition sources included summertime lightning strikes from convective storms and bimodal, human ignitions during the spring and fall seasons. Native Americans regularly set fires to improve sight lines for hunting, driving large game, improving grazing and browsing habitat, agricultural clearing, and enhancing vital ethnobotanical plants (Barrett 1980). The frequency and duration of flooding affect species composition, cover, and vegetative production due to alternating aerobic and anaerobic surface substrate conditions. Fires are likely occurred on a regular rotation interval and helped to reduce the accumulation of peat. The combination of fire and saturated soil conditions prevented the establishment of shrubs for any significant amount of time.

Drought and herbivory by native ungulates have also played a role in shaping this ecological site. The periodic episodes of reduced soil moisture in conjunction with the somewhat poorly drained soils have favored the proliferation of plant species tolerant of such conditions. Drought can also slow the growth of plants and result in dieback of certain species. Bison (Bos bison) grazing, while present, served a more limited role in community composition and structure than lands further west. Prairie elk (Cervus elaphus) and white-tailed deer (Odocoileus virginianus) likely contributed to woody species reduction but are also considered to be of a lesser impact compared to the west (LANDFIRE 2009). When coupled with fire, periods of drought and herbivory can further delay the establishment of woody vegetation (Pyne et al. 1996).

Today, Floodplain Prairies have been greatly reduced, possibly extirpated, as the land has been converted to agricultural production. Corn (*Zea mays* L.) and soybeans (*Glycine max* (L.) Merr.) are the dominant crops grown, but patches of forage land are also present on the landscape. A return to the historic plant community may not be possible due to significant hydrologic and water quality changes in the watershed in conjunction with extensive land modifications, but long-term conservation agriculture or habitat reconstruction efforts can help to restore some natural diversity and ecological functioning. The state-and-transition model that follows provides a detailed description of each state, community phase, pathway, and transition. This model is based on available experimental research, field observations, literature reviews, professional consensus, and interpretations.

State and transition model

Ecosystem states



T1A - Establish and maintain forage production.

T1B - Site converted to row crop agriculture

T2A - Site converted to row crop agriculture

R2A - Site preparation, non-native species control, and native seeding

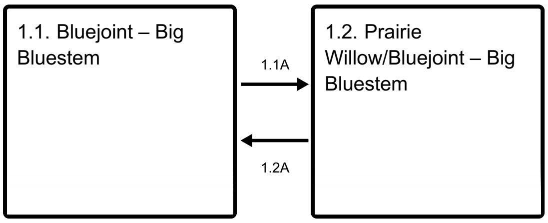
T3A - Establish and maintain forage production.

R3A - Site preparation, non-native species control, and native seeding

T4A - Establish and maintain forage production.

T4B - Site converted to row crop agriculture

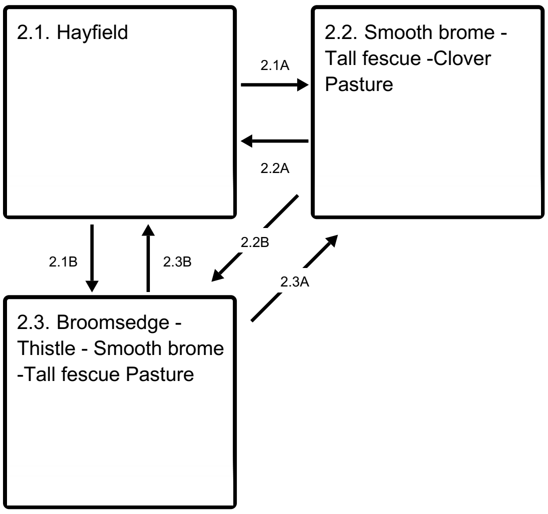
State 1 submodel, plant communities



1.1A - Natural succession; long fire free period

1.2A - Fire reduces shrub density

State 2 submodel, plant communities



2.1A - Grazing; balance of forage to animal use

2.1B - Grazing; overutilization of forage plants

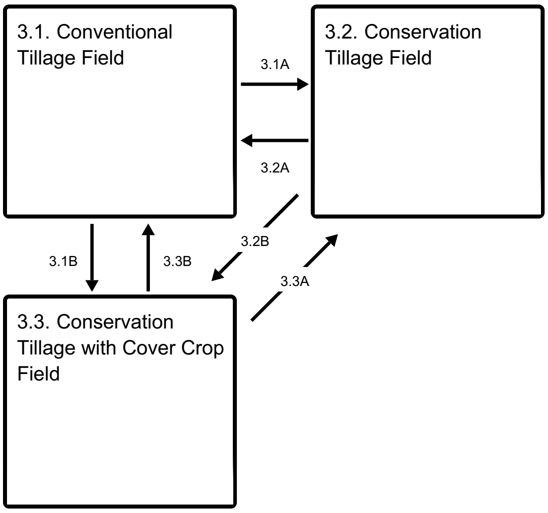
2.2A - Mechanical harvesting

2.2B - Grazing; overutilization of forage plants

2.3B - Mechanical harvesting

2.3A - Grazing; proper forage to animal balance

State 3 submodel, plant communities



3.1A - Less tillage, residue management

3.1B - Less tillage, residue management, and cover cropping

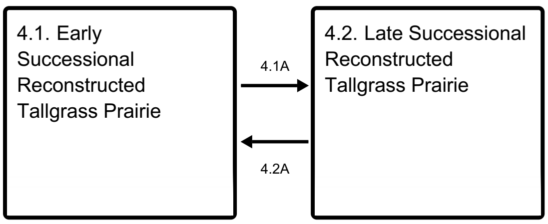
3.2A - Intensive tillage, remove residue, reinitiate monoculture row cropping

3.2B - Implementation of cover cropping

3.3B - Intensive tillage, remove residue, reinitiate monoculture row cropping

3.3A - Remove cover cropping

State 4 submodel, plant communities



4.1A - Implementation of restoration plan

4.2A - Setback in restoration progress

State 1
Reference State

The reference plant community is categorized as a tallgrass prairie community, dominated by mesic and wet-mesic herbaceous vegetation. The two community phases within the reference state are dependent on fire and flooding. The frequency, intensity, and duration of these events alter species composition, cover, and extent. Drought and native mammal grazing have more localized impacts in the reference phases, but do contribute to overall species composition, diversity, cover, and productivity.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- bluejoint (*Calamagrostis canadensis*), grass

Community 1.1
Bluejoint – Big Bluestem

Sites in this reference community phase are dominated by a mix of grasses and forbs. Vegetative cover is continuous (95 to 100 percent) and plants can reach heights between 3 and 6 feet tall (LANDFIRE 2009; NatureServe 2015). Bluejoint, big bluestem, prairie cordgrass, switchgrass, and Indiangrass are the dominant grasses present on the site. Characteristic forbs can include sawtooth sunflower (*Helianthus grosseserratus* M. Martens), prairie blazing star (*Liatris pycnostachya* Michx.), and golden zizia (*Zizia aurea* (L.) W.D.J. Koch) (NatureServe 2015). Occasional flooding maintains the wet-mesic vegetative composition and periodic low-intensity fires maintains the prairie structure. However, an extended fire return interval will allow some shrubs to establish, shifting the site to community phase 1.2.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- bluejoint (*Calamagrostis canadensis*), grass

Community 1.2
Prairie Willow/Bluejoint – Big Bluestem

This reference community phase represents natural successional following an extended fire return interval. The native tallgrass prairie community is still dominant, but shrubs, such as prairie willow (*Salix humilis* Marshall), can establish and form a scattered canopy across the floodplain prairie. Low-intensity fires will maintain the site, but a hot intensity fire will shift the community back to phase 1.1 (LANDFIRE 2009).

Dominant plant species

- prairie willow (*Salix humilis*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- big bluestem (*Andropogon gerardii*), grass

Pathway 1.1A
Community 1.1 to 1.2

Natural successional following an extended fire return interval.

Pathway 1.2A
Community 1.2 to 1.1

Hot intensity fire.

State 2
Pasture State

The Pasture state occurs when the site is converted to a farming system that emphasizes domestic livestock production known as grassland agriculture. Fire suppression, periodic cultural treatments (e.g., clipping, drainage, soil amendment applications, planting new species and/or cultivars, mechanical harvesting) and grazing by domesticated livestock transition and maintain this state (USDA-NRCS 2003). Early settlers seeded non-native species, such as smooth brome (*Bromus inermis* Leyss.) and Kentucky bluegrass (*Poa pratensis* L.), to help extend the grazing season (Smith 1998). Over time, as lands were continuously harvested or grazed by herds of cattle, the non-native species were able to spread and expand across the landscape, reducing the native species diversity and ecological function.

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), grass
- smooth brome (*Bromus inermis*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- clover (*Trifolium*), other herbaceous
- alfalfa (*Medicago*), other herbaceous

Community 2.1
Hayfield

Sites in this community phase consist of forage plants that are planted and mechanically harvested. Mechanical harvesting removes much of the aboveground biomass and nutrients that feed the soil microorganisms (Franzluebbers et al. 2000; USDA-NRCS 2003). As a result, soil biology is reduced leading to decreases in nutrient uptake by plants, soil organic matter, and soil aggregation. Frequent biomass removal can also reduce the site's carbon sequestration capacity (Skinner 2008).

Dominant plant species

- brome (*Bromus*), grass
- fescue (*Festuca*), grass
- bluegrass (*Poa*), grass
- clover (*Trifolium*), other herbaceous
- alfalfa (*Medicago*), other herbaceous

Community 2.2
Smooth brome -Tall fescue -Clover Pasture

This community is characterized by seeded cool-season grass and forbs. Species will depend upon landowner goals and objectives and may include many different grasses and forbs. Common species include smooth brome (*Bromus inermis*), tall fescue (Festuca arundinacea), Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pratense*), red clover (*Trifolium pratense*) and white clover (*Trifolium repens* L.). Management inputs include control of weeds and brush. These sites are managed to ensure a proper forage/animal balance. Plants are not overutilized and have adequate rest and recovery.

Dominant plant species

- brome (*Bromus*), grass
- fescue (*Festuca*), grass
- bluegrass (*Poa*), grass
- clover (*Trifolium*), other herbaceous

Community 2.3
Broomsedge -Thistle - Smooth brome -Tall fescue Pasture

Overutilization of the pasture will result in a shift to include more undesirable species such as thistle (Cirsium spp.), broomsedge (*Andropogon virginicus* L.), ironweed (*Vernonia gigantea*), buttercup (Ranunculus spp.), ragweed (Ambrosia spp.) and blackberries (Rubus spp.). Many woody and weed species may be present depending on seed sources and level of soil disturbance. This community reflects an improper forage-to-animal balance which will negatively impact forage productivity and reproduction, soil health, and water quality. Ecological resiliency is compromised under these conditions.

Dominant plant species

- broomsedge bluestem (*Andropogon virginicus*), grass
- fescue (*Festuca*), grass
- brome (*Bromus*), grass
- ironweed (*Vernonia*), other herbaceous
- buttercup (*Ranunculus*), other herbaceous
- ragweed (*Ambrosia*), other herbaceous

Pathway 2.1A
Community 2.1 to 2.2

Mechanical harvesting is replaced with domestic livestock grazing.

Pathway 2.1B
Community 2.1 to 2.3

Mechanical harvesting is replaced with domestic livestock grazing. Forage plants are overutilized allowing other weedy species to increase.

Pathway 2.2A
Community 2.2 to 2.1

Domestic livestock are removed, and mechanical harvesting is implemented.

Pathway 2.2B
Community 2.2 to 2.3

Grazing of livestock with overutilization of the forage plants.

Pathway 2.3B
Community 2.3 to 2.1

Domestic livestock are removed, and mechanical harvesting is implemented.

Pathway 2.3A
Community 2.3 to 2.2

Forage plants are not overutilized and the site has a proper forage-to-animal balance.

State 3
Cropland State

The continuous use of tillage, row-crop planting, and chemicals (i.e., herbicides, fertilizers, etc.) has effectively eliminated the reference community and many of its natural ecological functions in favor of crop production. Corn and soybeans are the dominant crops for the site, and oats (Avena L.) and alfalfa (*Medicago sativa* L.) may be rotated periodically. These areas are likely to remain in crop production for the foreseeable future.

Dominant plant species

- oat (*Avena hybrida*), grass
- corn (*Zea mays*), other herbaceous
- soybean (*Glycine max*), other herbaceous
- alfalfa (*Medicago*), other herbaceous

Community 3.1
Conventional Tillage Field

Community Phase 3.1 Conventional Tillage Field – Sites in this community phase typically consist of monoculture row-cropping maintained by conventional tillage practices. They are cropped in either continuous corn or corn-soybean rotations. The frequent use of deep tillage, low crop diversity, and bare soil conditions during the non-growing season negatively impacts soil health. Under these practices, soil aggregation is reduced or destroyed, soil organic matter is reduced, erosion and runoff are increased, and infiltration is decreased, which can ultimately lead to undesirable changes in the hydrology of the watershed (Tomer et al. 2005).

Community 3.2
Conservation Tillage Field

Community Phase 3.2 Conservation Tillage Field – This community phase is characterized by rotational crop production that utilizes various conservation tillage methods to promote soil health and reduce erosion. Conservation tillage methods include strip-till, ridge-till, vertical-till, or no-till planting systems. Strip-till keeps seedbed preparation to narrow bands less than one-third the width of the row where crop residue and soil consolidation are left undisturbed in-between seedbed areas. Strip-till planting may be completed in the fall and nutrient application either occurs simultaneously or at the time of planting. Ridge-till uses specialized equipment to create ridges in the seedbed and vegetative residue is left on the surface in between the ridges. Weeds are controlled with herbicides and/or cultivation, seedbed ridges are rebuilt during cultivation, and soils are left undisturbed from harvest to planting. Vertical-till systems employ machinery that lightly tills the soil and cuts up crop residue, mixing some of the residue into the top few inches of the soil while leaving a large portion on the surface. No-till management is the most conservative, disturbing soils only at the time of planting and fertilizer application. Compared to conventional tillage systems, conservation tillage methods can improve soil ecosystem function by reducing soil erosion, increasing organic matter and water availability, improving water quality, and reducing soil compaction.

Community 3.3
Conservation Tillage with Cover Crop Field

Community Phase 3.3 Conservation Tillage with Cover Crop Field – This community phase applies conservation tillage methods as described above as well as adds cover crop practices. Cover crops typically include nitrogen-fixing species (e.g., legumes), small grains (e.g., rye, wheat, oats), or forage covers (e.g., turnips, radishes, rapeseed). The addition of cover crops not only adds plant diversity but also promotes soil health by reducing soil erosion, limiting nitrogen leaching, suppressing weeds, increasing soil organic matter, and improving the overall soil ecosystem. In the case of small grain cover crops, surface cover and water infiltration are increased, while forage covers can be used to graze livestock or support local wildlife. Of the three community phases for this state, this phase promotes the greatest soil sustainability and improves ecological functioning within a cropland system.

Pathway 3.1A
Community 3.1 to 3.2

Tillage operations are greatly reduced, crop rotation occurs on a regular interval, and crop residue remains on the soil surface.

Pathway 3.1B
Community 3.1 to 3.3

Tillage operations are greatly reduced or eliminated, crop rotation occurs on a regular interval, crop residue remains on the soil surface, and cover crops are planted following crop harvest.

Pathway 3.2A
Community 3.2 to 3.1

Intensive tillage is utilized, and monoculture row-cropping is established.

Pathway 3.2B
Community 3.2 to 3.3

Cover crops are implemented to minimize soil erosion.

Pathway 3.3B
Community 3.3 to 3.1

Intensive tillage is utilized, cover crops practices are abandoned, monoculture row-cropping is established, and crop rotation is reduced or eliminated.

Pathway 3.3A
Community 3.3 to 3.2

Cover crop practices are abandoned.

State 4
Reconstructed Prairie State

Prairie reconstructions have become an important tool for repairing natural ecological functions and providing habitat protection for numerous grassland dependent species. Because the historic plant and soil biota communities of the tallgrass prairie were highly diverse with complex interrelationships, historic prairie replication cannot be guaranteed on landscapes that have been so extensively manipulated for extended timeframes (Kardol and Wardle 2010; Fierer et al. 2013). Therefore, ecological restoration should aim to aid the recovery of degraded, damaged, or destroyed ecosystems. A successful restoration will have the ability to structurally and functionally sustain itself, demonstrate resilience to the natural ranges of stress and disturbance, and create and maintain positive biotic and abiotic interactions (SER 2002). The reconstructed prairie state is the result of a long-term commitment involving a multi-step, adaptive management process. Diverse, species-rich seed mixes are important to utilize as they allow the site to undergo successional stages that exhibit changing composition and dominance over time (Smith et al. 2010). On-going management via prescribed fire and/or light grazing can help the site progress from an early successional community dominated by annuals and some weeds to a later seral stage composed of native, perennial grasses, forbs, and a few shrubs. Establishing a prescribed fire regimen that mimics natural disturbance patterns can increase native species cover and diversity while reducing cover of non-native forbs and grasses. Light grazing alone can help promote species richness, while grazing accompanied with fire can control the encroachment of woody vegetation (Brudvig et al. 2007).

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- bluejoint (*Calamagrostis canadensis*), grass

Community 4.1
Early Successional Reconstructed Tallgrass Prairie

This community phase represents the early community assembly from prairie reconstruction and is highly dependent on the seed mix utilized and the timing and priority of planting operations. The seed mix should look to include a diverse mix of cool-season and warm-season annual and perennial grasses and forbs typical of the reference state (e.g., bluejoint, big bluestem, sawtooth sunflower). Cool-season annuals can help provide litter that promotes cool, moist soil conditions to the benefit of the other species in the seed mix. The first season following site preparation and seeding will typically result in annuals and other volunteer species forming a majority of the vegetative cover. Control of non-native species, particularly perennial species, is crucial at this point to ensure they do not establish before the native vegetation (Martin and Wilsey 2012). After the first season, native warm-season grasses should begin to become more prominent on the landscape.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- bluejoint (*Calamagrostis canadensis*), grass

Community 4.2
Late Successional Reconstructed Tallgrass Prairie

Community Phase 4.2 Late Successional Reconstructed Tallgrass Prairie – Appropriately timed disturbance regimes (e.g., prescribed fire) applied to the early successional community phase can help increase the beta diversity, pushing the site into a late successional community phase over time. While prairie communities are dominated by grasses, these species can suppress forb establishment and reduce overall diversity and ecological function (Martin and Wilsey 2006; Williams et al. 2007). Reducing accumulated plant litter from perennial bunchgrasses allows more light and nutrients to become available for forb recruitment, allowing greater ecosystem complexity (Wilsey 2008).

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- bluejoint (*Calamagrostis canadensis*), grass

Pathway 4.1A
Community 4.1 to 4.2

Selective herbicides are used to control non-native species, and prescribed fire and/or light grazing help to increase the native species diversity and control non-oak woody vegetation.

Pathway 4.2A
Community 4.2 to 4.1

Reconstruction experiences a decrease in native species diversity from drought or improper timing of management actions (e.g., reduced fire frequency, use of non-selective herbicides).

Transition T1A
State 1 to 2

Cultural treatments to enhance forage quality and yield transitions the site to the pasture state (2).

Transition T1B
State 1 to 3

Tillage, seeding of agricultural crops, and non-selective herbicide transition this site to the cropland state (3).

Transition T2A
State 2 to 3

Tillage, seeding of agricultural crops, and non-selective herbicide transition this site to the cropland state (3).

Restoration pathway R2A
State 2 to 4

Site preparation, tree planting, invasive species control, and seeding native species transition this site to the reconstructed savanna state (4).

Transition T3A
State 3 to 2

Cultural treatments to enhance forage quality and yield transitions the site to the pasture state (2).

Restoration pathway R3A
State 3 to 4

Site preparation, tree planting, invasive species control, and seeding native species transition this site to the reconstructed savanna state (4).

Transition T4A
State 4 to 2

Cultural treatments to enhance forage quality and yield transition the site to the pasture state (2).

Transition T4B
State 4 to 3

Tillage, seeding of agricultural crops, and non-selective herbicide transition this site to the cropland state (3).

Context dependence. Agricultural conversion via tillage, seeding, and non-selective herbicide

Additional community tables

Inventory data references

No field plots were available for this site. A review of the scientific literature and professional experience were used to approximate the plant communities for this provisional ecological site. Information for the state-and-transition model was obtained from the same sources. All community phases are considered provisional based on these plots and the sources identified in this ecological site description.

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Contributors

Lisa Kluesner
Rick Francen

Approval

Suzanne Mayne-Kinney, 12/30/2024

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List of primary contributors and reviewers.
Organization Name Title Location
Iowa Department of Natural Resources Kevin Andersen State Private Lands Biologist Fairfield, IA
Natural Resources Conservation Service Patrick Chase State Soil Scientist Des Moines, IA
Ron Collman State Soil Scientist Champaign, IL
Tonie Endres Senior Regional Soil Scientist Indianapolis, IN
Rick Francen Soil Scientist Springfield, IL
Lisa Kluesner Ecological Site Specialist Waverly, IA
Jorge, Lugo-Camacho State Soil Scientist Columbia, MO
Kevin Norwood Soil Survey Regional Director Indianapolis, IN
Stanley Sipp Resource Inventory Specialist Champaign, IL
Jason Steele Area Resource Soil Scientist Fairfield, IA
Chris Tecklenberg Acting Regional Ecological Site Specialist Hutchinson, KS
Doug Wallace ACES Ecologist Columbia, MO

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)	Lisa Kluesner
Contact for lead author	
Date	01/09/2025
Approved by	Suzanne Mayne-Kinney
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:**

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

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

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

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

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

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

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):**

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

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

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:**

17. **Perennial plant reproductive capability:**