USDA Natural Resources Conservation Service

Ecological site R114XB903IN
Upland Prairie

Last updated: 11/16/2023
Accessed: 04/26/2024

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.

MLRA notes

Major Land Resource Area (MLRA): 114X–Southern Illinois and Indiana Thin Loess and Till Plain

This MLRA is a loess-covered till plain with broad, nearly level summits and steeper slopes in areas. dissected by tributaries of the Ohio and Mississippi Rivers. It is used to produce cash crops, feed grain, and livestock. This MLRA is in Indiana (47 percent), Illinois (38 percent), and Ohio (15 percent) in four separate areas. It makes up about 10,388 square miles (26,904 square kilometers).

This area is in the Till Plains section of the Central Lowland province of the Interior Plains. 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 or gently sloping. Steep slopes are along rivers and streams. Elevation ranges from 310 feet (90 meters) on the southernmost flood plains to 1,340 feet (410 meters) on the highest ridges. Local relief is mainly 10 to 50 feet (3 to 15 meters) but can be 50 to 100 feet (15 to 30 meters) along drainageways and streams.
The Little Miami River flows through the part of this MLRA in Ohio. The Ohio River flows along the southernmost boundary in some parts of this area in Ohio. The Kaskaskia River flows through the part of this area in Illinois. Tributaries to the Mississippi and Ohio Rivers drain this MLRA.

This area is covered dominantly by loess and Illinoian-age till or outwash. Most of the loess is Late Wisconsin-age Peoria Loess. In some places the Peoria Loess in underlain by Early Wisconsin-age Roxana Silt or by sandier or grittier loess. The loess ranges from 3 to 7 feet (1 or 2 meters) in thickness on stable summits and does not occur on some of the steeper slopes. The underlying Illinoian-age till and outwash commonly contain a paleosol. Meltwater outwash and lacustrine and alluvial deposits are on some of the stream terraces along the major tributaries. The till and outwash are underlain by several bedrock systems. Mississippian and Pennsylvanian bedrock occurs mostly in the western part of the MLRA. Ordovician, Silurian, and Devonian bedrock occurs mostly in the central part. Bedrock outcrops are common on the bluffs along the large rivers and their major tributaries. They also are evident at the base of steep slopes along minor streams and drainageways.

The average annual precipitation ranges from 39 to 47 inches (990 to 1,190 millimeters) with a mean of 42 inches (1,060 millimeters). The annual temperature ranges from 53 to 56 degrees F (11.8 to 13.6 degrees C) with a mean of 55 degrees F (13 degrees C). The freeze-free period ranges from 185 to 215 days with a mean of 200 days.

The dominant soil orders are Alfisols and Entisols. 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 deep or very deep, poorly drained to well drained, and loamy, silty, or clayey. Although limited in extent, some soils have a natric horizon in the part of the MLRA in Illinois. The main soils and their series: Albaqualfs that formed in loess or loess over pedisediment on till plains (Marine series); Endoaqualfs that formed in loess or loess over pedisedimenton till plains (Oconee series); Fluvaquents that formed in alluvium on flood plains (Wakeland series); Fragiudalfs that formed in loess over pedisediment over till (Cincinnati series) and loess over till (Rossmoyne series) on till plains; Glossaqualfs that formed in loess over till on till plains (Avonburg, Clermont, and Cobbsfork series) Hapludalfs that formed in till (Hickory series) and loess over pedisediment (Homen series) on till plains.

The soils on uplands support natural hardwoods. Oak, hickory, beech, and sugar maple are the dominant species. Native grasses grow in some scattered areas between the trees. The soils in low-lying areas support mixed forest vegetation. Pin oak, shingle oak, sweetgum, and black oak are the dominant species on the wetter sites. White oak, black oak, northern red oak, hickory, yellow-poplar, ash, sugar maple, and black walnut grow on the better drained sites. Honey locust is dominant on soils that formed in shaly limestone residuum. Silver maple, eastern cottonwood, American sycamore, pin oak, elm, and sweetgum grow along rivers and streams. Black walnut is abundant on very deep, well drained soils on some small flood plains. Sedge and grass meadows and scattered trees are on some low-lying sites.

Most of this MLRA is in farms and used to produce corn, soybeans, and livestock. Some small grains, including winter wheat, oats, and grain sorghum, also are grown. A small acreage is used for specialty crops, such as popcorn and apple orchards. The grassland supports introduced and native grasses. The forested areas are mainly on steep valley sides and in low-lying parts of flood plains. Surface coal mines make up a small acreage. (USDA, Natural Resources Conservation Service. 2022).

LRU notes

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Classification relationships

Major Land Resource Area (MLRA) (USDA-NRCS, 2022):
114X–Southern Illinois and Indiana Thin Loess and Till Plain

U.S. Forest Service Ecoregions (Cleland et al. 2007):
Domain: Humid Temperate Domain
Division: Hot Continental Division
Province: Eastern Broadleaf Forest (Continental)
Province Code: 222

NatureServe Ecological System(s) and/or Associations:
The following NatureServe Explorer Ecological System Record has a substantial level of probability to match the ecological site reference community found on these soils:
CENTRAL TALLGRASS PRAIRIE (CES205.683)

Ecological site concept

The reference community for Upland Prairie sites is a tallgrass prairie with an array of warm-season grasses and native forbs. Common species include big bluestem, little bluestem, Indiana grass, and switchgrass (Panicum virgatum). On high quality sites, a wide variety of herbaceous species will be present.

Historically, fire was a key driver in maintaining these prairie sites. Secondary to fire, the grazing of native species such as buffalo, elk and deer also helped maintain the prairie system. Native Americans set fires regularly to improve grazing habitat and game populations.

Without a regular fire regime, these sites will increase in tree seedling and saplings. LANDFIRE estimates that absence of fire over 10 years will result in a substantial increase in shrubs and saplings.

Most sites today are utilized for agricultural production- either row crops, cool season pasture, or warm season pasture. There are some small, remnant prairies remaining that exhibit the diversity potential of this ecosystem. Restoration to a functioning native prairie is possible with committed management and long-term effort.

Associated sites

R114XB902IN	**Wet Upland Prairie** The Wet Upland Prairie ecological site and the Upland Prairie ecological site occurs on similar landscapes such as ground moraines and till plains. Both sites have very deep soils; however, the Upland Prairie sites are moderately well to well drained with a season water table from 24 to 42 inches in depth whereas Wet Upland Prairie sites are somewhat poorly to poorly drained with a year round water table from 0 to 24 inches in depth.

R114XB901IN	**Sodium Affected Uplands** The Sodium Affected Upland ecological site and Upland Prairie ecological site occurs on similar landscapes with the Sodium Affected Upland site on lower landscapes such as till plains and depressions. Sodium Affected Upland sites have lower percentages of clay within the soil texture and has a natric horizon with sodium present in the soil.

Similar sites

R114XB902IN	**Wet Upland Prairie** The Wet Upland Prairie ecological site and the Upland Prairie ecological site occurs on similar landscapes such as ground moraines and till plains. Both sites have very deep soils; however, the Upland Prairie sites are moderately well to well drained with a season water table from 24 to 42 inches in depth whereas Wet Upland Prairie sites are somewhat poorly to poorly drained with a year round water table from 0 to 24 inches in depth.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Ceanothus americanus*
Herbaceous	(1) *Andropogon gerardii* (2) *Schizachyrium scoparium*

Physiographic features

Mapunits in this group are mapped on multiple landforms including ground moraine, knoll, , ridge, and till plain.

Table 2. Representative physiographic features

Landforms	(1) Ground moraine (2) Ridge (3) Knoll (4) Till plain
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	400–1,250 ft
Slope	1–18%
Water table depth	24–42 in
Aspect	Aspect is not a significant factor

Climatic features

About 60 percent of the precipitation falls during the freeze-free period. Most of the rainfall occurs as high-intensity, convective thunderstorms during summer. Snowfall is common in winter. The freeze-free period averages about 185 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	147-167 days
Freeze-free period (characteristic range)	178-193 days
Precipitation total (characteristic range)	41-45 in
Frost-free period (actual range)	136-169 days
Freeze-free period (actual range)	174-195 days
Precipitation total (actual range)	41-47 in

Frost-free period (average)	155 days
Freeze-free period (average)	185 days
Precipitation total (average)	44 in

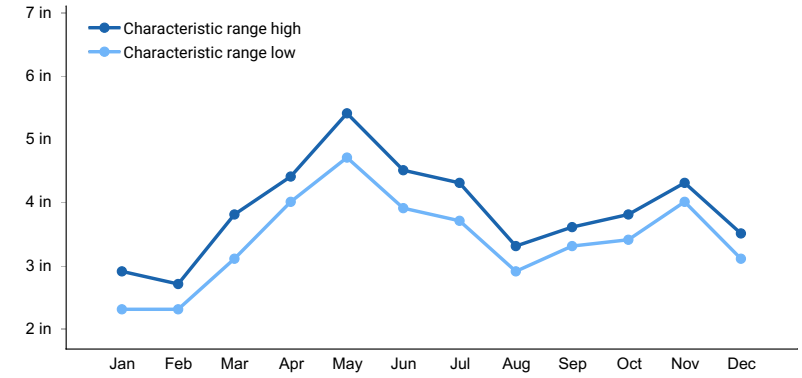

Figure 1. Monthly precipitation range

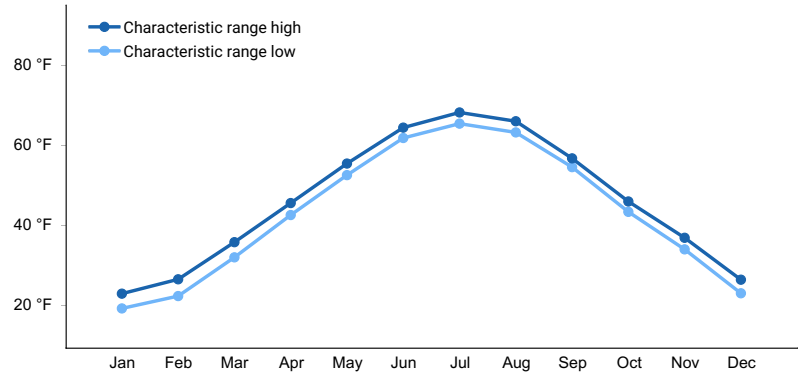

Figure 2. Monthly minimum temperature range

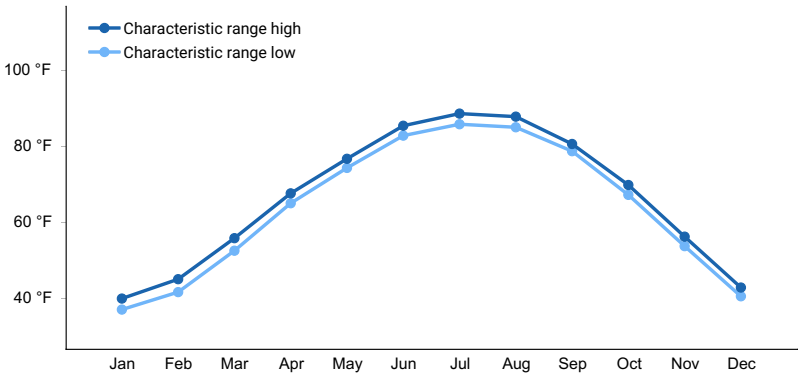

Figure 3. Monthly maximum temperature range

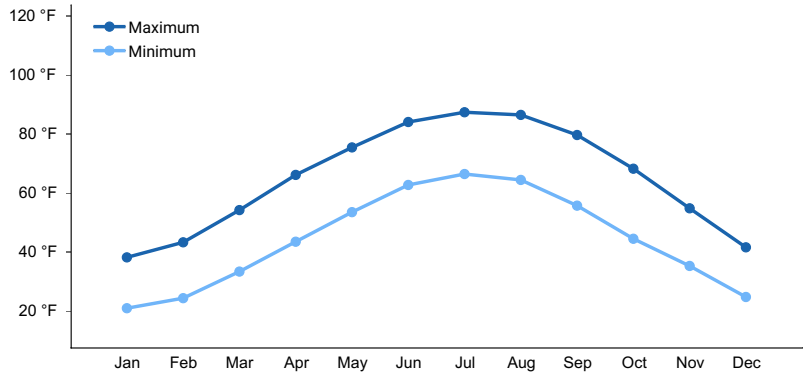

Figure 4. Monthly average minimum and maximum temperature

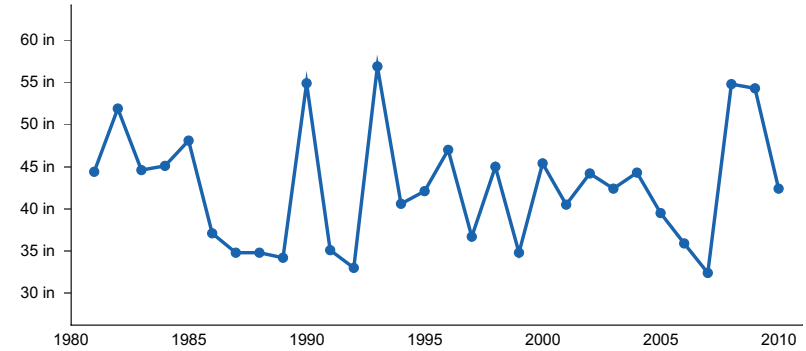

Figure 5. Annual precipitation pattern

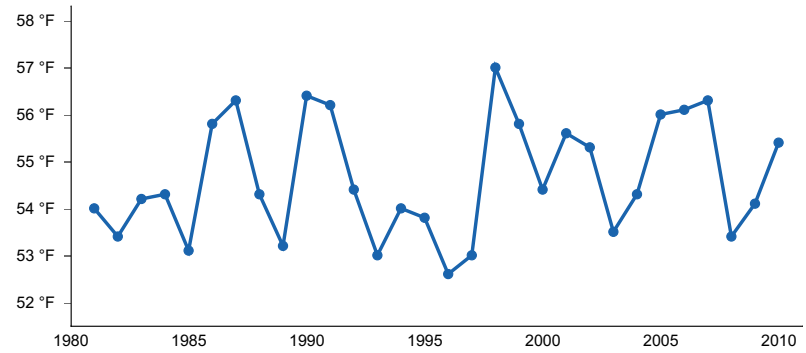

Figure 6. Annual average temperature pattern

Climate stations used

- (1) HILLSBORO [USC00114108], Hillsboro, IL
- (2) CARBONDALE SOUTHERN IL AP [USW00093810], De Soto, IL
- (3) SPARTA 1 W [USC00118147], Sparta, IL
- (4) SPENCER [USC00128290], Spencer, IN
- (5) SHAKAMAK SP [USC00127959], Jasonville, IN
- (6) PANA 3E [USC00116579], Pana, IL
- (7) JERSEYVILLE 2 SW [USC00114489], Jerseyville, IL
- (8) WATERLOO [USC00119002], Waterloo, IL

Influencing water features

Sites may rarely flooded as they are located near a riparian areas. These sites can also be influenced by a seasonal water table.

Soil features

Soils in this group are very deep, moderately well drained to well drained, and located on uplands. Series currently

include Aviston, Downsouth, Pana, and Velma.

Table 4. Representative soil features

Parent material	(1) Till (2) Loess (3) Pedisediment
Surface texture	(1) Silt loam (2) Loam (3) Silty clay loam
Drainage class	Moderately well drained to well drained
Permeability class	Moderate to moderately rapid
Soil depth	80 in
Surface fragment cover <=3"	0–1%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	4.7–9 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.1–7.3
Subsurface fragment volume <=3" (0-40in)	0–10%
Subsurface fragment volume >3" (0-40in)	0–3%

Ecological dynamics

The Upland Prairie reference site is a tallgrass prairie with an array of warm-season grasses and native forbs. Common species include big bluestem, little bluestem, Indiana grass, and switchgrass. On high quality sites, a wide variety of herbaceous species will be present.

Historically, fire was a key driver in maintaining these prairie sites. Secondary to fire, the grazing of native species such as buffalo, elk and deer also helped maintain the prairie system. Native Americans set fires regularly to improve grazing habitat and game populations. Without a regular fire regime, these sites will increase in tree seedling and saplings. LANDFIRE estimates that absence of fire over 10 years will result in a substantial increase in saplings.

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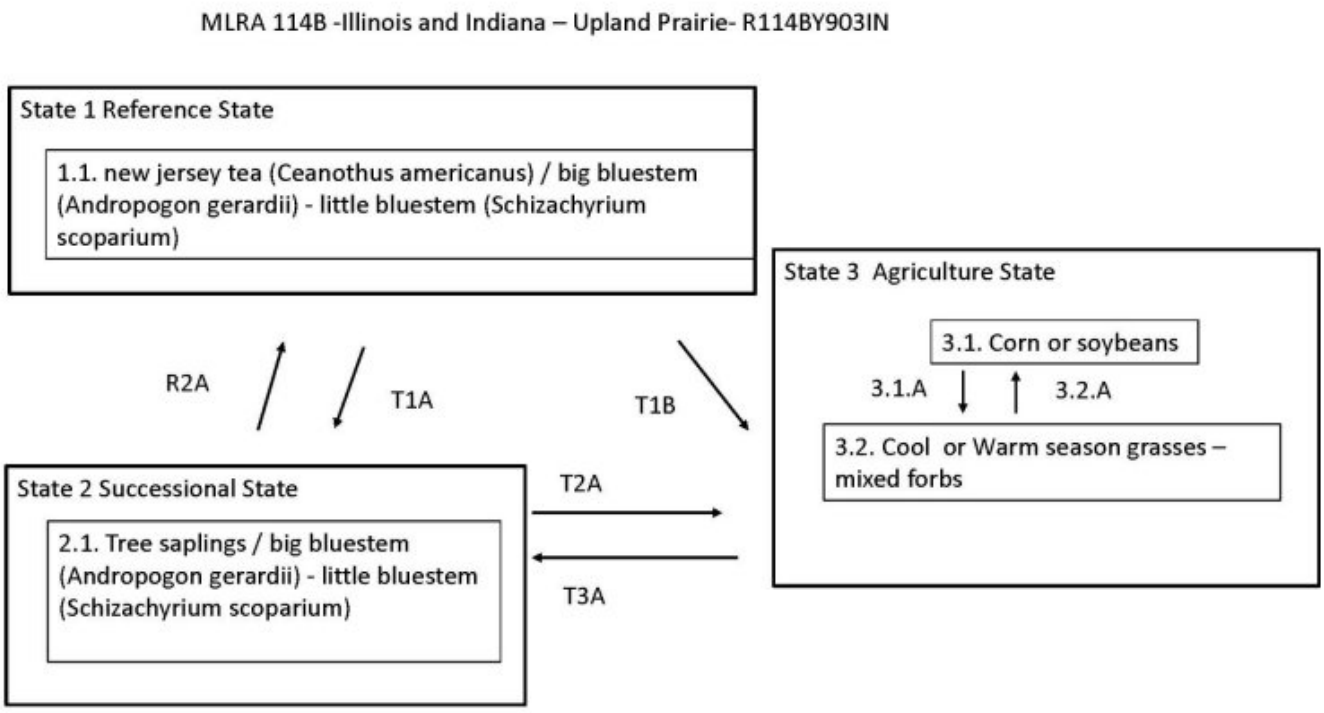
State and transition model



State 1
Reference State

Tallgrass prairie. Multiple species of warm season grasses, sedges, and herbaceous plants may be present.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- little bluestem (*Schizachyrium scoparium*), grass
- switchgrass (*Panicum virgatum*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- milkweed (*Asclepias*), other herbaceous
- coneflower (*Rudbeckia*), other herbaceous
- compassplant (*Silphium laciniatum*), other herbaceous
- blazing star (*Liatris*), other herbaceous
- sunflower (*Helianthus*), other herbaceous

Community 1.1
Reference Community

These sites were historically a diverse tallgrass prairie with many different species of native grasses, sedges and herbaceous plants. A wide diversity of herbaceous species are found on these sites.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass

- little bluestem (*Schizachyrium scoparium*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- switchgrass (*Panicum virgatum*), grass
- coneflower (*Rudbeckia*), other herbaceous
- milkweed (*Asclepias*), other herbaceous
- compassplant (*Silphium laciniatum*), other herbaceous
- blazing star (*Liatris*), other herbaceous
- sunflower (*Helianthus*), other herbaceous

State 2
Successional State

This state has tree saplings and shrubs encroaching upon the grass dominated prairie system. Species will vary depending upon seed sources and disturbance regimes. Longer fire intervals and limited or no grazing will continue to allow for increases in trees and shrubs and a reduction in prairie species.

Dominant plant species

- hybrid hickory (*Carya*), tree
- cottonwood (*Populus*), tree
- oak (*Quercus*), tree
- sumac (*Rhus*), shrub
- blackberry (*Rubus*), shrub
- switchgrass (*Panicum virgatum*), grass
- little bluestem (*Schizachyrium scoparium*), grass

Community 2.1
Successional Community

This community is characterized by encroaching trees and shrubs. As the density and size of tree and shrubs increases, prairie species will continue to decline. Species will vary greatly depending on disturbance history and seed sources.

Dominant plant species

- hybrid hickory (*Carya*), tree
- cottonwood (*Populus*), tree
- oak (*Quercus*), tree
- sumac (*Rhus*), shrub
- blackberry (*Rubus*), shrub
- switchgrass (*Panicum virgatum*), grass
- little bluestem (*Schizachyrium scoparium*), grass

State 3
Agricultural State

This state is characterized by the conversion of the site to agricultural use. Most common practice is a row crop rotation of various types. A small portion of the historic acres are used for forage and pasture. Species and management inputs will depend upon landowner objectives and goals.

Dominant plant species

- fescue (*Festuca*), grass
- brome (*Bromus*), grass
- corn (*Zea mays*), other herbaceous
- soybean (*Glycine max*), other herbaceous
- red clover (*Trifolium pratense*), other herbaceous
- white clover (*Trifolium repens*), other herbaceous

Community 3.1
Cropland

Numerous crops can be grown. Species will depend upon landowner goals and objectives.

Dominant plant species

- corn (*Zea mays*), other herbaceous
- soybean (*Glycine max*), other herbaceous

Community 3.2
Pasture-Forage

Sites may be utilized for forage production. Species selection will depend upon landowner objectives.

Dominant plant species

- brome (*Bromus*), grass
- tall fescue (*Schedonorus arundinaceus*), grass
- Kentucky bluegrass (*Poa pratensis*), grass
- red clover (*Trifolium pratense*), other herbaceous
- white clover (*Trifolium repens*), other herbaceous

Pathway 3.1.A
Community 3.1 to 3.2

Planting of cool and/or warm season pasture/forage species and management inputs to maintain them.

Pathway 3.2.A
Community 3.2 to 3.1

Planting, either by conventional or no-till methods, of row crop. Management that keeps the site in row crop production. Species will depend upon landowner objectives.

Transition T1A
State 1 to 2

Reduction in fire and/or grazing on the landscape. Species will vary greatly depending on past disturbances, current on-going disturbances and seed sources.

Transition T1B
State 1 to 3

Forest for conversion to agricultural production. This could be row crops, cool season pasture, or warm season pasture depending on landowner objectives. Many plant species are feasible for this transition and selection will depend upon landowner objectives.

Restoration pathway R2A
State 2 to 1

Restoration from successional to prairie states will likely require management inputs such as prescribed fire, managed grazing, brush removal, seeding and weed control.

Transition T2A
State 2 to 3

Transition from successional state to agricultural state. Management activities would be determined by the landowner’s production objectives.

Transition T3A
State 3 to 2

Transition from agricultural state to successional state. Abandoning farmland will result in the system moving toward a shrub-sapling-herbaceous community. Weeds will be problematic without management and native warm season grasses would be rare or absent unless previously utilized as part of a pasture. Seed sources will determine plant community composition.

Additional community tables

Inventory data references

No field monitoring was conducted as part of this PES development. Future ESD development may result in plant community edits, soil mapunits being added or removed from this grouping, and/or additions or modifications to the narratives, tables, vegetation descriptions and state and transition model.

Other references

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Approval

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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	04/26/2024
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:**