USDA Natural Resources Conservation Service

Ecological site F113XY905IL
Wet Upland Woodland

Last updated: 5/17/2024
Accessed: 05/12/2025

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): 113X–Central Claypan Areas

The eastern Illinois portion of the Central Claypan Areas MLRA is in the Till Plains Section of the Central Lowland Province of the Interior Plains (USDA-NRCS, 2006) and includes the Southern Till Plain Natural Division of the natural divisions of Illinois (Schwegman, 1973; 1997; IDNR, 2018) in south-central Illinois. South-central Illinois is a dissected Illinoisan till plain south of the terminal Wisconsin moraine. This region consists of nearly level to gently sloping, old till plains. Stream valleys are shallow and generally are narrow. Elevation is about 660 feet (200 meters), increasing gradually from south to north. Local relief is generally low on the broad, flat till plains and flood plains and high on the dissected hills bordering rivers or drainage systems. The Kaskaskia, Little Muddy, Little Wabash, Embarras, and Skillet Fork rivers are part of this area. This region is covered with loess, which overlies old glacial drift (Illinoisan till) that has a high content of clay. Fragipans are also present. Pennsylvanian limestone and shale bedrock underlay the glacial till. The dominant soil orders in this region are Alfisol and Mollisol. The soils in the area predominantly have a mesic soil temperature regime, an aquic or udic soil moisture regime, and mixed or smectitic mineralogy. They generally are very deep, well drained to poorly drained, and loamy or clayey. (USDA-NRCS, 2006).

Classification relationships

Major Land Resource Area (MLRA) (USDA-NRCS, 2022):
113 – Central Claypan Areas

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
Section: Central Till Plains, Oak-Hickory Section
Section Code: 222G

Relationship to other established ecological classifications:
Biophysical Setting (LANDFIRE, 2018); the reference community of this ecological site is most similar to: South-Central Interior/Upper Coastal Plain; CES203.479.

National Vegetation Classification System (NatureServe, 2018): the reference community of this ecological site is most similar to the following NVC Association: Quercus palustris - Quercus bicolor – Acer rubrum. Flatwoods Forest; CEGL002101.

Illinois Natural Areas Survey (INAS) (White, 1978); the reference community of this ecological site is most similar to: INAS Community Class – Forest; Natural community – Southern Flatwoods

Ecological site concept

This woodland community type is found in south-central Illinois throughout the Central Claypan Areas MLRA. Wet Upland Woodland ecological sites occur on broad, flat summits of hillslopes and knolls with slopes of 0 to 2 percent in soils that formed in clayey glacial till containing a strongly developed brownish colored paleosol that seasonally perches water. The historic reference plant community had an open tree canopy dominated by pin oak (Quercus palustris Münchh.1) and swamp white oak (Quercus bicolor Willd.) (White, 1978; NatureServe, 2017).

Wet Upland Woodlands are dominated by broadleaf deciduous trees, with sparse to well-developed understory, shrub, and herbaceous strata. The dominant canopy species is typically pin oak (Quercus palustris Münchh.). Other trees often encountered include American elm (Ulmus americana L.), ash (Fraxinus spp.), southern red oak (Quercus falcata Michx.), and post oak (Quercus stellata Wangenh.). Swamp white oak (Quercus bicolor Willd.) can be plentiful in this type. The subcanopy is sparse, although a diverse mixture of bottomland species such as sweet woodreed (Cinna arundinacea L.) can be present as well. Possumhaw (Ilex decidua Walter) and green hawthorn (Crataegus viridis L.) dominate the shrub layer. Sedges (Carex spp.) dominate the herbaceous layer, but a diverse mixture of forbs can also be present. Narrowleaf mountainmint (Pycnanthemum tenuifolium Schrad.), an aromatic herbaceous species more commonly associated with dry uplands, is frequently present and reflects the dry conditions seasonally found in this forest. Numerous ubiquitous species grow in this natural community; the most commonly encountered are trumpet creeper (Campsis radicans (L.) Seem. ex Bureau) and eastern posion ivy (Toxicodendron radicans (L.) Kuntze) which dominate the vine stratum (LANDFIRE, 2018; NatureServe, 2018; White 1978).

Woodlands were distinguished from forest, by their relatively open understory, and the presence of sun-loving ground flora species (White, 1994). Fire was the primary disturbance factor that maintained this ecological site, while drought, windthrow, and grazing were secondary factors (LANDFIRE 2009).

1 All plant common and scientific names in this document were obtained from the U.S. Department of Agriculture – Natural Resources Conservation Service National PLANTS Database (USDA NRCS, 2018).

Associated sites

R113XY904IL	**Upland Prairie** Prairie ecological site often upslope but on dark colored soils associated with nearly level till plains.
F113XY907IL	**Fragic Till Plain Woodland** Ecological site often downslope on areas with fragipan soils with slopes greater than 2 percent but less than 7 percent.
F113XY910IL	**Fragic Backslope Woodland** Wooded ecological sites often downslope on areas with fragipan soils and slopes greater than 5 percent.
F113XY911IL	**Loamy Till Backslope Forest** Forested ecological site on adjacent steeper slopes.

Similar sites

F113XY907IL	**Fragic Till Plain Woodland** Ecological site often downslope on areas with fragipan soils with slopes greater than 2 percent but less than 7 percent.

Table 1. Dominant plant species

Tree	(1) *Quercus palustris* (2) *Quercus bicolor*
Shrub	(1) *Crataegus viridis*
Herbaceous	(1) *Cinna arundinacea* (2) *Carex*

Physiographic features

This site is on broad, flat summits of hillslopes and knolls with slopes of 0 to 2 percent. The sit generates negligible runoff to adjacent downslope ecological sites. This site does not flood.

Table 2. Representative physiographic features

Landforms	(1) Upland > Depression (2) Upland > Till plain (3) Upland > Ground moraine (4) Upland > Structural bench (5) Upland > Fan
Runoff class	Negligible
Ponding frequency	None to occasional
Elevation	361–836 ft
Slope	0–2%
Water table depth	6–24 in
Aspect	Aspect is not a significant factor

Climatic features

The soil temperature regime of MLRA 113 is classified as mesic, where the mean annual soil temperature is between 47 and 59°F. Temperature and precipitation occur along a north-south gradient, where temperature and precipitation increase the further south you travel. The majority of the precipitation occurs as rainfall in the form of convective thunderstorms during the growing season.

Table 3. Representative climatic features

Frost-free period (characteristic range)	156-162 days
Freeze-free period (characteristic range)	184-190 days
Precipitation total (characteristic range)	44-48 in
Frost-free period (actual range)	154-164 days
Freeze-free period (actual range)	182-194 days
Precipitation total (actual range)	43-48 in
Frost-free period (average)	159 days
Freeze-free period (average)	187 days
Precipitation total (average)	46 in

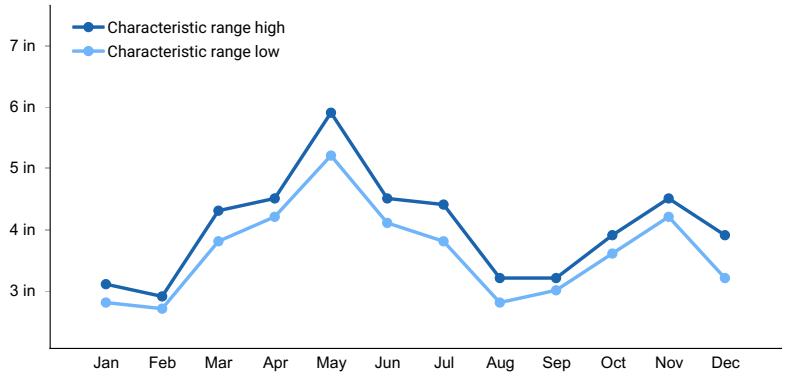


Figure 1. Monthly precipitation range

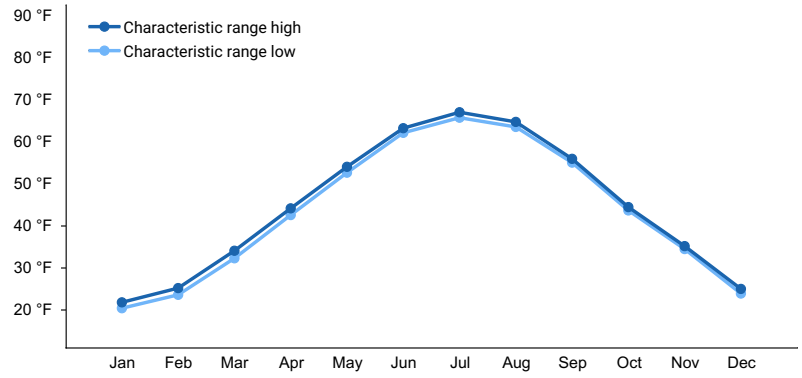


Figure 2. Monthly minimum temperature range

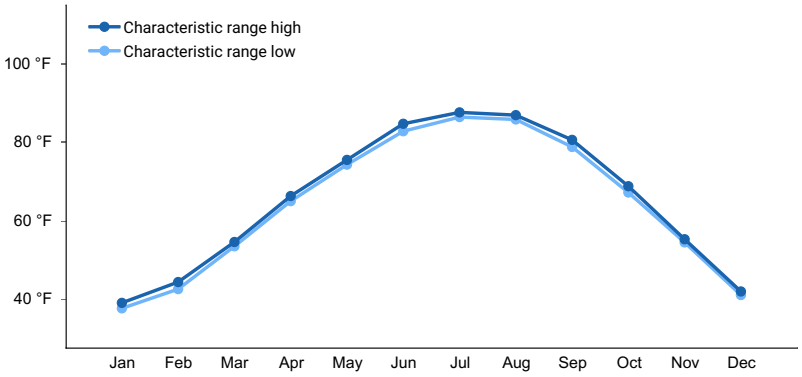


Figure 3. Monthly maximum temperature range

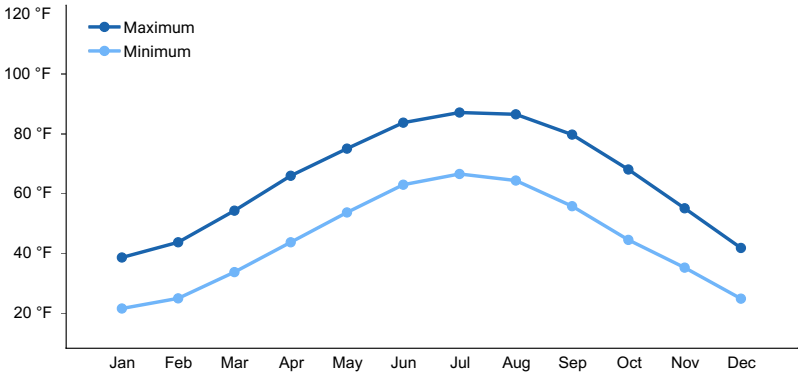


Figure 4. Monthly average minimum and maximum temperature

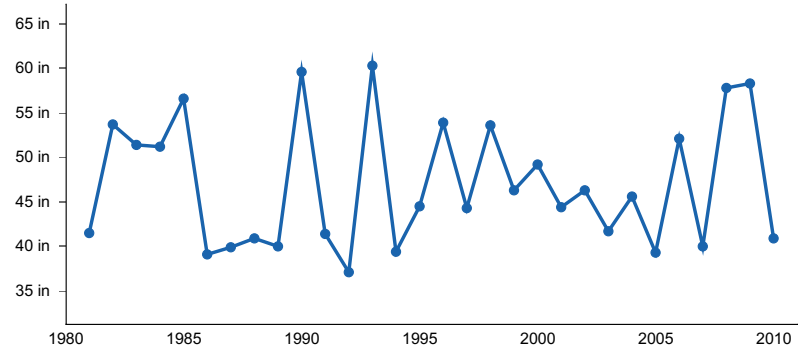


Figure 5. Annual precipitation pattern

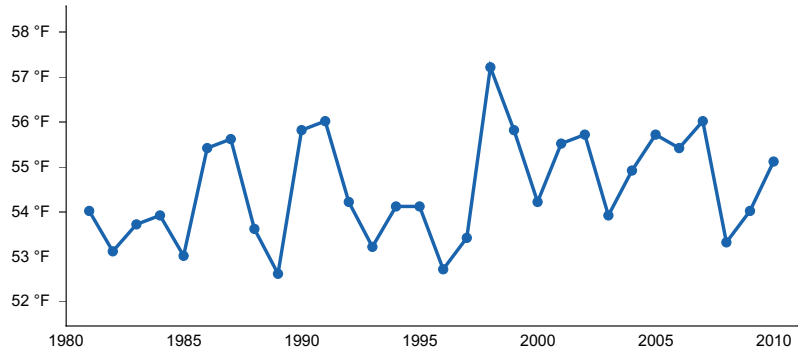


Figure 6. Annual average temperature pattern

Climate stations used

- (1) MARION 4 NNE [USC00115342], Marion, IL
- (2) MT VERNON 3 NE [USC00115943], Mount Vernon, IL
- (3) OLNEY 2S [USC00116446], Olney, IL
- (4) DU QUOIN 4 SE [USC00112483], Du Quoin, IL
- (5) EFFINGHAM 3SW [USW00093816], Effingham, IL

Influencing water features

This ecological site is influenced by a seasonal high water table from high groundwater levels, as well as slow hydraulic conductivity, which impedes through flow from precipitation. The water table is typically near the surface in late fall through spring, receding in the summer. Some depression areas pond for short periods of time, mostly in the spring. These shallow depression areas were more common prior to the conversion of many areas of this ecological site from woodland to cropland. Leveling and surface drainage have reduced or eliminated the shallow depressions. Infiltration is very slow and surface runoff is negligible. These areas have a claypan, clay layer or fragic horizon near the surface, with a slow rate of water transmission.

Wetland description

This ecological site contains wetlands which fit into the MINERAL FLAT class in the hydrogeomorphic (HGM) system (Brinson, 1993). The water source is direct precipitation, because there are no upslope contributing sites. Vertical water percolation in the soil is impeded by the clayey subsoil (claypan) or fragic horizon resulting in significant lateral discharge to adjacent downslope ecological sites. This discharge supports surface saturation in the adjacent areas. In general, MINERAL FLAT areas provide watershed recharge and runoff that accumulates in downslope reaches as groundwater discharge and surface water accumulation. Wetland hydrology is effectively removed by surface ditches or subsurface tile drainage that directs vertical downward movement in a horizontal direction to the drainage element.

Soil features

This soil is very deep, somewhat poorly and poorly drained and seasonally wet. It formed in loess or silty sediments overlying Illinoian till that contains a strongly developed Sangamon paleosol. A seasonal high water table, at or near the surface to 2 feet below the surface, is present through the spring, receding in the summer. Soils of this ecological site are in the Alfisol order, further classified as fine, smectitic, mesic Aeric Fragic Epiaqualfs, fine-silty, mixed, superactive, mesic Aeric Endoaqualfs, fine-silty, mixed, superactive, mesic Typic Endoaqualfs, fine, smectitic, mesic Typic Albaqualfs. Soil series associated with this site include Bluford, Creal, Racoon, and Wynoose.

Table 4. Representative soil features

Parent material	(1) Till
Surface texture	(1) Silt loam
Drainage class	Somewhat poorly drained to poorly drained

Permeability class	Very slow
Depth to restrictive layer	16–72 in
Soil depth	72 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	4–8 in
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Soil reaction (1:1 water) (Depth not specified)	4.1–7.3
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Structural and species variation in a Wet Upland Woodland is regulated by the duration and depth of flooding, moisture availability, and soil physical properties. Soils are slowly to very slowly permeable due to a high clay content or the presence of a weak fragic horizon. This results in a shallow, perched water table during the winter and spring and dry conditions during the summer and fall, thereby restricting rooting depth. Ponding of water in shallow depressions encourages growth of hydrophytic vegetation during the growing season. During the summer and periods of drought, soils in this community can become quite dry. This characteristic encourages the growth of vegetation typically associated with dry uplands (Robertson et al. 1984)

Because of their proximity to prairies, fire likely played a significant role in the maintenance of these systems. It is likely that these ecological sites burned at least once every 3 to 5 years. These periodic fires kept woodlands open, removed the litter, and stimulated the growth and flowering of the grasses and forbs. During fire free intervals, woody understory species increased and the herbaceous understory diminished. The return of fire would open the woodlands up again and stimulate the abundant ground flora species (Anderson, 1975; Brugam et.al., 2016). (White, 1978).

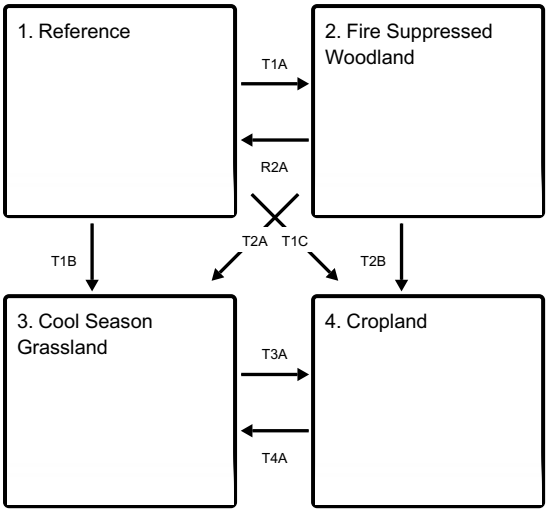
Wet Upland Woodlands were also subjected to occasional disturbances from wind and ice, as well as grazing by native large herbivores, such as bison (Bos bison), prairie elk (Cervus elaphus), and white-tailed deer (Odocoileus virginianus). Wind and ice would have periodically opened the canopy up by knocking over trees or breaking substantial branches off canopy trees. Grazing by large native herbivores would have effectively kept understory conditions more open, creating conditions more favorable to oak reproduction and woodland ground flora species (Anderson, 1982).

Today, many of these ecological sites have been cleared, drained and converted to grassland and some cropland. The remaining woodland ecological sites have a younger (50 to 80 years) canopy layer whose species composition and quality has been altered by timber harvesting practices and uncontrolled grazing (IDNR, 2018). In the long term absence of fire, woody species, especially hickory and red maple, encroach into these woodlands. Once established, these woody plants can quickly fill the existing understory increasing shade levels with a greatly diminished ground flora. Removal of the younger understory and the application of prescribed fire have proven to be effective restoration means (Dey and Kabrick, 2015).

A provisional state and transition diagram is depicted in Figure 2. 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 may change as knowledge increases.

State and transition model

Ecosystem states



T1A - Fire suppression greater than 10 years

T1B - Tillage; vegetative seeding; grassland management

T1C - Tillage; conservation cropping system; water management

R2A - Forest stand improvement; livestock access control; prescribed fire, 3-5 years; long term stand rotation

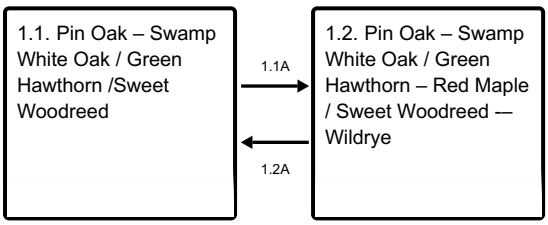
T2A - Woody removal; tillage; vegetative seeding; grassland management

T2B - Woody removal; tillage; conservation cropping system

T3A - Tillage; conservation cropping system; water management

T4A - Vegetative seeding ; grassland management

State 1 submodel, plant communities

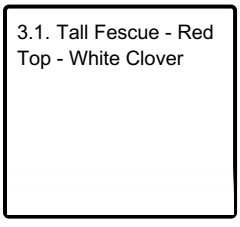


1.1A - Fire interval greater than 10 years

1.2A - Fire interval 3-5 years

State 2 submodel, plant communities

State 3 submodel, plant communities



State 4 submodel, plant communities

4.1. Corn, Soybeans, Wheat

State 1
Reference

These open woodland communities were strongly influenced by fire and seasonal soil wetness. Herbivory by native (now expatriated) ungulates also played a role. Consequently, fire-tolerant oaks over a ground flora of native prairie grasses, sedges and wildflowers made up the Wet Upland Woodland ecological site. There are two phases associated with this reference state.

Dominant plant species

- pin oak (*Quercus palustris*), tree
- swamp white oak (*Quercus bicolor*), tree
- green hawthorn (*Crataegus viridis*), shrub
- sedge (*Carex*), grass

Community 1.1
Pin Oak – Swamp White Oak / Green Hawthorn /Sweet Woodreed

This open woodland community likely had a two-tiered structure. The abundant herbaceous layer is dominated by sedges and wide variety of forbs. Fire frequency was probably every 3 to 5 years. This continued fire and natural native grazing would have maintained the more open canopy and profusion of ground flora species.

Dominant plant species

- pin oak (*Quercus palustris*), tree
- swamp white oak (*Quercus bicolor*), tree
- green hawthorn (*Crataegus viridis*), shrub
- sedge (*Carex*), grass
- sweet woodreed (*Cinna arundinacea*), other herbaceous

Community 1.2
Pin Oak – Swamp White Oak / Green Hawthorn – Red Maple / Sweet Woodreed –– Wildrye

This woodland community phase likely had a three-tiered structure. It is characterized by an abundant understory of saplings and shrubs. The herbaceous layer is dominated by grasses and sedges. Fire-free intervals ranged from 5 to 20 years.

Dominant plant species

- pin oak (*Quercus palustris*), tree
- swamp white oak (*Quercus bicolor*), tree
- green hawthorn (*Crataegus viridis*), shrub
- sedge (*Carex*), grass
- wildrye (*Elymus*), grass

Pathway 1.1A
Community 1.1 to 1.2

Fire interval greater than 10 years

Pathway 1.2A
Community 1.2 to 1.1

Fire interval 3-5 years

State 2
Fire Suppressed Woodland

Many current areas have experienced fire exclusion for decades along with periodic domestic livestock uncontrolled grazing. In the absence of fire, ongoing recruitment of trees into the canopy develops a closed canopy, shading out the herbaceous ground flora. Red maple and midstory species such as American elm may also increase. Herbaceous cover and diversity greatly diminishes, leaf litter builds up, and more shade-tolerant woodland species persist. Transition to cool season grasslands (State 3) or intensive cropland (State 4) is common.

Dominant plant species

- pin oak (*Quercus palustris*), tree
- swamp white oak (*Quercus bicolor*), tree
- red maple (*Acer rubrum*), tree
- American elm (*Ulmus americana*), tree
- goldenrod (*Solidago*), other herbaceous

Community 2.1
Pin Oak - Swamp White Oak / Red Maple - American Elm / Goldenrod

Some of the plant species found in this community can be pin oak, swamp white oaj, red maple, American elm and goldenrod

State 3
Cool Season Grassland

Conversion of other states to non-native cool season species such as tall fescue (*Schedonorus arundinaceus* (Schreb.) Dumort., nom. cons.), red top (*Agrostis stolonifera* L.) and white clover (*Trifolium repens* L.) has been common in the Illinois Central Claypan area. Occasionally, these grasslands may have scattered swamp white and pin 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.

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), grass
- creeping bentgrass (*Agrostis stolonifera*), grass
- white clover (*Trifolium repens*), other herbaceous

Community 3.1
Tall Fescue - Red Top - White Clover

Non-native species such as tall fescue, red top, and white clover have been seeded to this plant community phase.

State 4
Cropland

This is an occasional state that exists with intensive cropping of corn (*Zea mays* L.), soybeans (*Glycine max* (L.) Merr.), and winter wheat (*Triticum aestivum* L.) occurring. Water management activites are needed to maximize yields. Some conversion to cool season grassland occurs for a limited period of time before transitioning back to cropland.

Dominant plant species

- corn (*Zea mays*), grass

- common wheat (*Triticum aestivum*), grass
- soybean (*Glycine max*), other herbaceous

Community 4.1
Corn, Soybeans, Wheat

Major annual crops are corn, soybeans or wheat.

Transition T1A
State 1 to 2

Fire suppression greater than 10 years

Transition T1B
State 1 to 3

Clearing/woody removal, tillage; vegetative seeding; grassland management

Transition T1C
State 1 to 4

Tillage; conservation cropping system; water management

Restoration pathway R2A
State 2 to 1

Forest stand improvement; livestock access control; prescribed fire, 3-5 years; long term stand rotation

Transition T2A
State 2 to 3

Woody removal; tillage; vegetative seeding; grassland management

Transition T2B
State 2 to 4

Woody removal; tillage; conservation cropping system

Transition T3A
State 3 to 4

Tillage; conservation cropping system; water management

Transition T4A
State 4 to 3

Vegetative seeding ; grassland management

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 and ecological dynamics 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 the sources identified in ecological site description.

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Contributors

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Approval

Suzanne Mayne-Kinney, 5/17/2024

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	05/17/2024
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:**