USDA Natural Resources Conservation Service

Ecological site R108XD824IA
Wet Upland Drainageway Prairie

Last updated: 10/17/2024
Accessed: 05/10/2025

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.

Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 108X–Illinois and Iowa Deep Loess and Drift

The Illinois and Iowa Deep Loess and Drift, Western Part MLRA covers parts of both Iowa and Missouri and is known locally as part of the Southern Iowa Drift Plain. A silty loess deposit of varying thickness (5 to 20 feet) covers a series of glacial advances known collectively as pre-Illinoisan till. This till, deposited more than half a million years ago, was subjected to multiple instances of extreme erosion as well as periods of subdued erosion and intense weathering. The loess is thickest in the western part of the MLRA and generally thins eastward. In some areas, the loess has been removed and the older weathered till, called a “paleosol,” entirely exposed. These highly weathered soils, or paleosols, have a high content of clay, which slows the downward movement of water through the profile and causes water to move laterally instead of vertically. Wet areas, or “side-hill seeps,” commonly form where these paleosols become exposed along hillsides (Prior, 1991).

The dominant soil orders in this MLRA are Mollisols and Alfisols and, to a lesser extent, Entisols and Inceptisols. Most of the soils are Udolls or Udalfs. Aquolls are on the flatter interfluves. The soils in the area dominantly have a mesic soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. They generally are very deep, well drained to poorly drained, and silty, loamy, or clayey. These soils on uplands include somewhat poorly drained, nearly level Argiudolls (Macksburg series); moderately well drained, gently sloping to strongly sloping Argiudolls (Sharpsburg series); poorly drained, nearly level Argiaquolls (Winterset series); and well drained strongly, sloping to steep Hapludalfs (Gara, Lindley, Ladoga, and Armstrong series) (USDA-NRCS, 2006). The western part of the Illinois and Iowa Deep Loess and Drift is a segment of three other MLRAs within the Central Feed Grains and Livestock Region. The other areas are: the West-Central part (108C), the East-Central part (108B) and the Eastern part (108A).

Classification relationships

Major Land Resource Area (MLRA): Illinois and Iowa Deep Loess and Drift, Western Part (108D)

USFS Subregions: Central Dissected Till Plains Section (251C); Loess Hills (251Cb) and Central Dissected Till and Loess Plain (251Cc) Subsections (Cleland et al, 2007)

Relationship to Other Established Classifications:
NatureServe Classification: Ecological System: North-Central Interior Dry-Mesic Oak Forest and Woodland (4116); Ecological Association: Central Cordgrass Wet Prairie (NatureServe, 2013)

Landfire Biophysical Setting: Central Tallgrass Prairie (4314210) (Landfire, 2009)

Ecological site concept

These sites formed in local alluvium parent material and can be found in drainageways on uplands. Typically these sites are located down slope from wet upland prairie ecological sites and intermingled with Loamy Upland Drainageway Prairies and Loamy Footslope Savannas. Soils are typically Mollisols, characterized by deep, dark colored surfaces high in organic matter due to the dominant prairie vegetation and have no rooting restrictions. Plant communities consist of mostly grasses, sedges, forbs and shrubs.

Associated sites

R108XD841IA	**Loamy Footslope Savanna** Loamy Footslope Savanna. Fine-loamy and fine-silty textured soils including Arbor, Ely, Judson and Olmitz series.
R108XD864IA	**Wet Upland Prairie** Wet Up.land Prairie. Fine textured soils including Sperry, Winterset, Clarinda, Rinda and Clearfield series.
R108XD863IA	**Till Upland Prairie** Till Upland Prairie. Fine and fine-loamy soils, including Adair, Armstrong, Bucknell, Gara, Lamoni and Shelby.

Similar sites

R108XD864IA	**Wet Upland Prairie** Wet Upland Prairie. Fine textured soils including Sperry, Winterset, Clarinda, Rinda and Clearfield series.
R108XD821IA	**Loamy Upland Drainageway Prairie** Loamy Upland Drainageway Prairie.Fine-silty soil including the Kennebec series.
F108XD851IA	**Loamy Upland Drainageway Woodland** Loamy Upland Drainageway Woodland.Fine-silty soil including the Nodaway series.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Calamagrostis canadensis* (2) *Carex pellita*

Physiographic features

Wet Upland Drainageway Prairies are of large extent, and can be found in drainageways in uplands throughout MLRA 108D. These sites are within a dissected till plain landscape. Slopes are generally less than 5 percent. These sites typically occur in areas where soil deposits from upslope have accumulated.

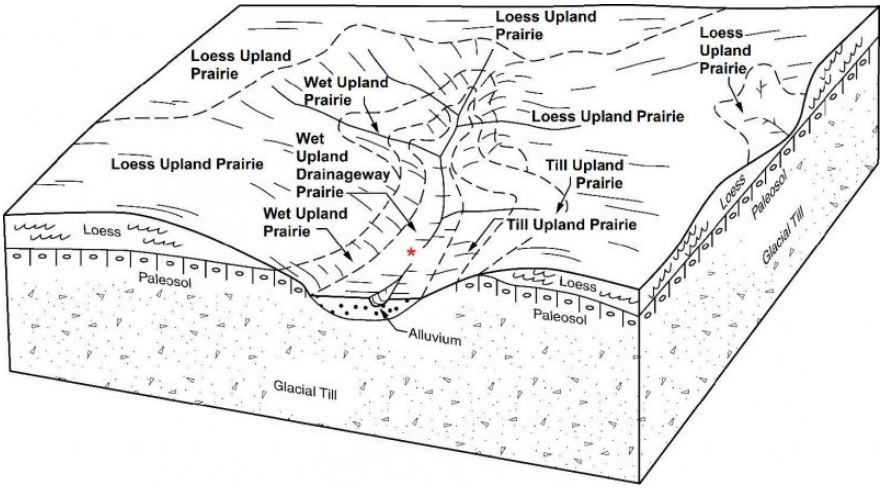


Figure 2. Block diagrams representing typical soil-landform sequences in Loess Ridges. Red asterisk identifies soil component correlated to Wet Upland Drainageway Prairie.

Table 2. Representative physiographic features

Landforms	(1) Drainageway
Runoff class	Negligible to low
Flooding frequency	None to frequent
Ponding frequency	None
Elevation	499–1,558 ft
Water table depth	0–48 in
Aspect	Aspect is not a significant factor

Climatic features

The soil temperature regime of MLRA 108D is classified as “mesic” where the mean annual soil temperature is between 46 and 59°F (Soil Survey Staff, 2014). The average freeze-free period of this ecological site is about 166 days, while the frost-free period is about 144 days.

Average annual precipitation is 31 inches, which includes rainfall plus the water equivalent from snowfall.. The average annual low and high temperatures are 38 and 60°F, respectively.

Table 3. Representative climatic features

Frost-free period (characteristic range)	139-150 days
Freeze-free period (characteristic range)	164-176 days
Precipitation total (characteristic range)	36-37 in
Frost-free period (actual range)	135-152 days
Freeze-free period (actual range)	159-182 days
Precipitation total (actual range)	35-38 in
Frost-free period (average)	143 days
Freeze-free period (average)	170 days
Precipitation total (average)	36 in

Climate stations used

- (1) GREENFIELD [USC00133438], Greenfield, IA
- (2) KNOXVILLE [USC00134502], Knoxville, IA
- (3) DES MOINES INTL AP [USW00014933], Des Moines, IA
- (4) BEDFORD [USC00130576], Bedford, IA
- (5) INDIANOLA 2W [USC00134063], Indianola, IA
- (6) CLARINDA [USC00131533], Clarinda, IA
- (7) CRESTON 2 SW [USC00131962], Creston, IA

Influencing water features

The drainage at this site is somewhat poor or poor. Permeability is moderate to very slow. The soil at this site is in hydrologic group B (Hydrologic Soil Group, 2016). The land capability class is 2w (Land Capability Classification, 2016). Depth of endosaturation is between 0 and 4 feet. This ecological site is influenced by a seasonal high water table, resulting from a combination of high groundwater levels and slow hydraulic conductivity, which impedes throughflow from precipitation and flood events. The water table is typically near the surface in late fall through spring, receding in the summer.

This site is in the SLOPE wetlands class of the Hydrogeomorphic (HGM) classification system (Brinson, 1993), and are Emergent Palustrine wetlands (Cowardin et al., 1979).
This ecological site contains first-order streams, which originate from headslope positions at the upper reaches of the units, and are fed from smaller headslopes in the adjacent uplands. The lower reaches of units often contain second-order streams. These streams are ephemeral in most years, with flow in the late fall, winter, and spring months, generally disappearing in the summer, or reduced to isolated pools in the lower reaches. Stream levels typically respond quickly to storm events, especially in watersheds where surface runoff is dominant. Short-duration flooding is common in many areas. Streambeds are typically incised into the surrounding floodplain by as much as 10 feet.

Soil features

These soils have no major rooting restriction. The soils were formed under prairie vegetation, and have dark, organic-rich surface horizons. Parent material is alluvium. The soils have silt loam or silty clay loam surface horizons. Subsoils are silt loam, silty clay loam or silty clay. Soil series associated with this site include Ackmore, Colo, Vesser and Zook.

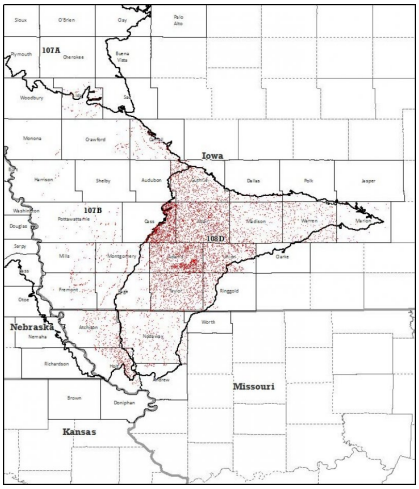


Figure 9. Distribution of Wet Upland Drainageway Prairies within MLRA 108D

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Silt loam (2) Silty clay loam
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Very slow to moderate
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	6.3–8.8 in
Calcium carbonate equivalent (Depth not specified)	0%
Soil reaction (1:1 water) (Depth not specified)	6–6.9
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

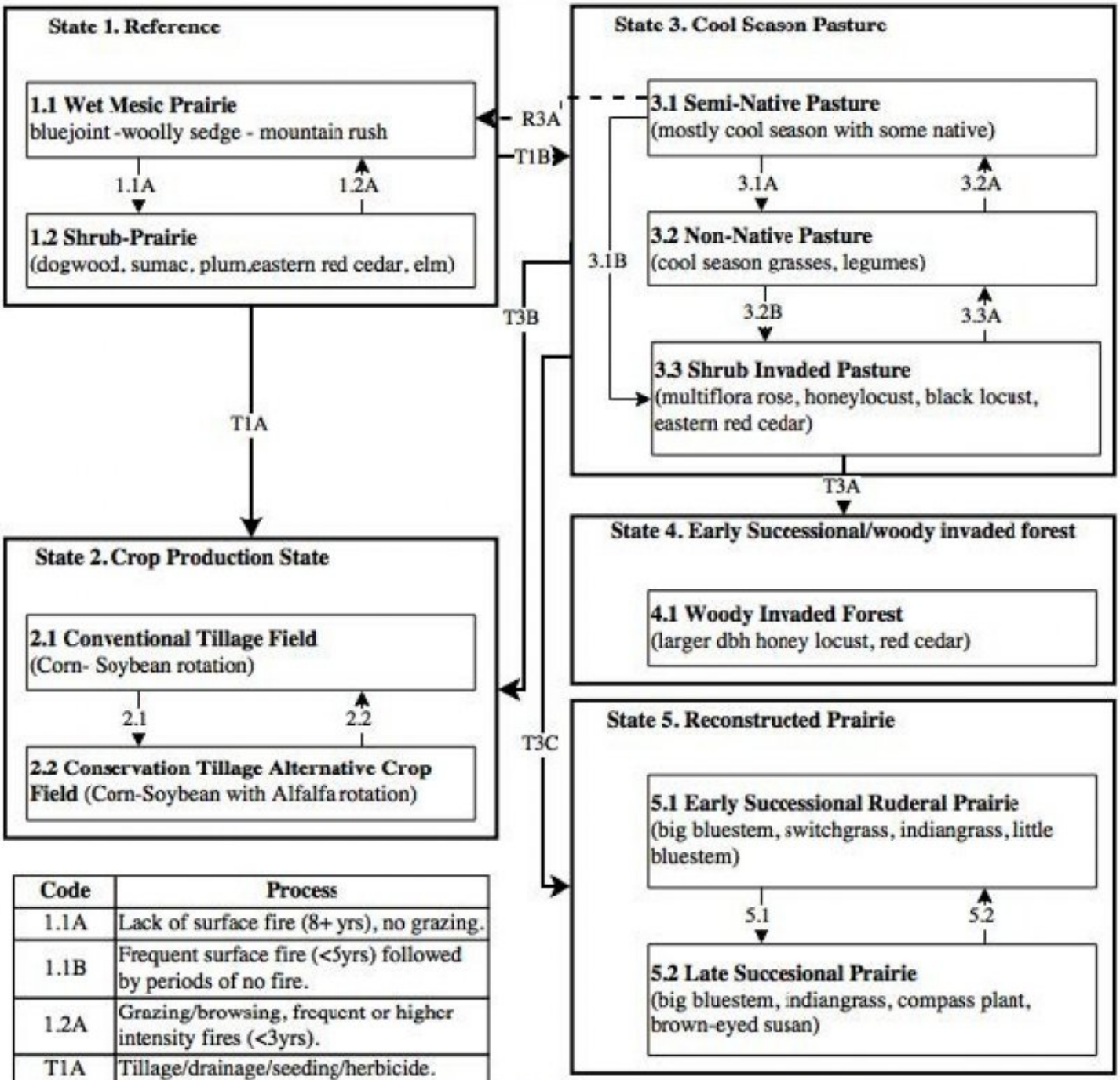
Ecological dynamics

Reference plant community is categorized as a wet mesic upland prairie and includes grasses and sedges, forbs, and shrubs. Species composition typically includes Spartina pectinate, Calamagrostis Canadensis, *Carex pellita*, and *Juncus arcticus* littoralis.
Fire, grazing, drought, are all disturbances influencing the dynamics at this site. These sites likely burned 3 to 5 times every 10 years. Grazing by whitetail deer, prairie elk, was common, and bison as well may have been also present grazing to a lesser extent. Disturbances from these animals removed thatch, litter, and reduced the proliferation of small trees and shrubs (Mutel, 2008).

As this region was settled, these prairies were typically altered to better suit agricultural needs. Corn and soybean production is common in these areas today. Very few small remnants of this prairie exist now.

State and transition model

R108DY824IA Wet Upland Drainageway Prairie



Code	Process
1.1A	Lack of surface fire (8+ yrs), no grazing.
1.1B	Frequent surface fire (<5yrs) followed by periods of no fire.
1.2A	Grazing/browsing, frequent or higher intensity fires (<3yrs).
T1A	Tillage/drainage/seeding/herbicide.
2.1	Less Tillage; residue management; crop rotation.
2.2	Intensive Tillage; less residue; monoculture cropping.
3.1A	Herbicide, inter-seeding.
3.2A	Overgrazing, lack ofseeding/herbicide.
3.1B, 3.2B	Abandonment.
3.3A	Brush management/herticide/seeding.
T3A	Abandonment (20+yrs).

Code	Process
T3B	Sodbuster, tillage, drainage, seeding.
R3A	Prescribed fire (spring/earlysummer)/grazing, reduce cool season grasses, selective grass herbicides.
T3C	Site preparation, herbicide, brush management, seeding, tillage.
T1B	Plowing, seeding; overgrazing.
5.1	Natural forb reseeding or by mechanical planting/seeding.
5.2	Forb failure due to drought and/or poor seeding methods.

State 1
Reference State

As a mesic tall grass prairie, this state has a reference plant community which is categorized as upland prairie and includes grasses and sedges, and forbs. Extended periods with no fire and no grazing can cause this state to shift into a shrub-prairie. Conversely, Grazing and browsing accompanied by frequent or high intensity fires can ultimately shift this phase back towards the reference community. In addition, frequent fires followed by periods of no fire can cause an oak savanna phase to form.

Dominant plant species

- bluejoint (*Calamagrostis canadensis*), grass
- woolly sedge (*Carex pellita*), grass
- mountain rush (*Juncus arcticus ssp. littoralis*), grass

Community 1.1
Wet Mesic Prairie

Wet grassland prairie ecosystem.

Dominant plant species

- bluejoint (*Calamagrostis canadensis*), grass
- woolly sedge (*Carex pellita*), grass

Community 1.2
Shrub Prairie

Site invaded by shrub species.

Dominant plant species

- dogwood (*Cornus*), shrub
- sumac (*Rhus*), shrub
- elm (*Ulmus*), shrub
- eastern redcedar (*Juniperus virginiana*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- woolly sedge (*Carex pellita*), grass
- mountain rush (*Juncus arcticus ssp. littoralis*), grass

Pathway P1.1A
Community 1.1 to 1.2

Lack of fire 8 plus years, no grazing

Pathway P1.2A
Community 1.2 to 1.1

Grazing/browsing, frequent or higher intensity fires three years interval or less.

State 2
Crop Production State

This state is the most common. Tillage, drainage, seeding and herbicide has destroyed all of the original prairie. Corn and soybeans are the principal crops. Variation in management within this state creates a wide range of soil properties and can be detrimental to the environment.

Community 2.1
Conventional tillage field

Corn and soybean rotation is most common crops on these sites; however, many different crops can be produced

depending on the landowner objectives..

Community 2.2
Conservation tillage alternative crop field

A corn and soybean rotation with the addition of an alfalfa rotation to improve soil health.

Dominant plant species

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

Pathway P2.1A
Community 2.1 to 2.2

less tillage; residue management; crop rotation

Pathway P2.2A
Community 2.2 to 2.1

Intensive tillage; less residue; mono-culture cropping.

State 3
Cool Season Pasture State

A native reference state transformed into a cool season pasture due to a suppression of fire and heavy grazing by livestock. Very little inputs to the original reference state make this state a possibility for restoration to the reference state. This path would need prescribed fire, grazing, and a reduction of cool season grasses by using a selective herbicide. With a combination of inputs of non- selective herbicide and inter-seeding, the semi-native pasture transitions to a non-native pasture. Continual management is required to prevent invasion of shrubs. This can occur if the site is overgrazed and seeding and herbicide are discontinued

Community 3.1
Semi Native Pasture

mostly cool season grasses with some natives

Community 3.2
Non Native Pasture

cool season grasses and legumes

Community 3.3
Shrub Invaded Pasture

cool season grasses invaded by multiflora rose, honeylocust, black locust, eastern red cedar.

Pathway P3.1A
Community 3.1 to 3.2

Herbicide, interseeding

Pathway P3.1B
Community 3.1 to 3.3

Abandonment.

Pathway P3.2A
Community 3.2 to 3.1

Overgrazing; lack of seeding/herbicide

Pathway P3.2B
Community 3.2 to 3.3

Abandonment

Pathway P3.3A
Community 3.3 to 3.2

Brush management, herbicide, seeding

State 4
Early Successional Woody Invaded Forest State

Abandonment of the shrub invaded pasture for 20 or more years will result in a woody invaded forest consisting of larger DBH honey locust and red cedar. At this state a significant amount of input and resources would be required to reverse the invaded woody species (Woodland Health, 2004).

Dominant plant species

- honeylocust (*Gleditsia triacanthos*), tree
- eastern redcedar (*Juniperus virginiana*), tree

Community 4.1
Woody Invaded Forest

larger dbh honey locust and red cedar

Dominant plant species

- honeylocust (*Gleditsia triacanthos*), tree
- eastern redcedar (*Juniperus virginiana*), tree

State 5
Reconstructed Prairie State

Prairie reconstruction is accomplished through site preparation, herbicide, brush management seeding and tillage. Careful management and planting/seeding of forbs or natural propagation will further develop this from an early successional ruderal prairie to a late successional prairie.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- switchgrass (*Panicum virgatum*), grass

Community 5.1
Early Successional Ruderal Prairie

Seeding prairie species in early development

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- switchgrass (*Panicum virgatum*), grass

- Indiangrass (*Sorghastrum*), grass
- little bluestem (*Schizachyrium scoparium*), grass

Community 5.2
Late Successional Prairie

Mix of tallgrass species and native forbs

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum nutans*), grass
- compassplant (*Silphium laciniatum*), other herbaceous
- browneyed Susan (*Rudbeckia triloba*), other herbaceous

Pathway P5.1A
Community 5.1 to 5.2

Natural forb reseeding or by mechanical planting/seeding

Pathway P5.2A
Community 5.2 to 5.1

Forb failure due to drought and or poor seeding methods

Transition T1A
State 1 to 2

Tillage, seeding, herbicide.

Transition T1B
State 1 to 3

Plowing, seeding, grazing

Restoration pathway R3A
State 3 to 1

Prescribed fire, grazing, herbicides

Transition T3B
State 3 to 2

Sodbuster, tillage, seeding

Transition T3A
State 3 to 4

Abandonment 20 years plus

Transition T3C
State 3 to 5

site preparation, herbicide, brush management, seeding

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 ecological site description.

Other references

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Contributors

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Approval

Suzanne Mayne-Kinney, 10/17/2024

Acknowledgments

This ESD was originally approved prior to April 2021.

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.

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Contact for lead author	
Date	05/10/2025
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):

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**
