

Ecological site R111XE401OH Wet Outwash Mollisol

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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): 111X–Indiana and Ohio Till Plain

111E – Indiana and Ohio Till Plain, Eastern Part. Most of this area is in the Till Plains Section of the Central Lowlands Province of the Interior Plains. The northeast tip of the area is in the Southern New York Section of the Appalachian Highlands. The entire area has been glaciated. It is dominated by ground moraines that are broken in places by kames, lake plains, outwash plains, terraces, and stream valleys. Narrow, shallow valleys commonly are along the few large streams in the area. Elevation ranges from 580 to 1,400 feet (175 to 425 meters), increasing gradually from west to east. Relief is mainly a few meters, but in some areas hills rise as much as 100 feet (30 meters) above the adjoining plain.

The extent of the major Hydrologic Unit Areas (identified by four-digit numbers) that make up this MLRA is as follows: Scioto (0506), 33 percent; Muskingum (0504), 31 percent; and Western Lake Erie (0410), 28 percent; Upper Ohio (0503), 5 percent; and Southern Lake Erie (0411), 3 percent. The headwaters of many rivers in central Ohio, including the Vermillion, Black Fork, Sandusky, Little Scioto, and Olentangy Rivers, are in this MLRA.

This MLRA is underlain by late Devonian shale and sandstone. Surficial materials include glacial deposits of till, glaciolacustrine sediments, and outwash from Wisconsin and older glacial periods.

Classification relationships

Major Land Resource Area (USDA-Natural Resources Conservation Service, 2006)

USFS Ecological Regions (USDA, 2007):

Sections –Central Till Plains, Beech Maple (222H), Western Glaciated Allegheny Plateau (221F)

Subsections – Allegheny Plateau (221Fa), Bluffton Till Plains (222Ha), Miami-Scioto Plain – Tipton Till Plain (222Hb)

NatureServe Systems anticipated (NatureServe, 2011): Agriculture - Cultivated Crops and Irrigated Agriculture, Agriculture – Pasture/Hay, North-Central Interior Beech-Maple Forest, North-Central Interior Dry-Mesic Oak Forest and Woodland, North-Central Interior Floodplain

LANDFIRE Biophysical Settings anticipated (USGS, 2010): Central Interior and Appalachian Floodplain Systems, North-Central Interior Beech-Maple Forest, North-Central Interior Dry-Mesic Oak Forest and Woodland

Ecological site concept

This site is an upland site formed on glacial outwash parent materials in soils that are very poorly, poorly, or somewhat poorly drained. The soils surface color is dark (3/2 Munsell or darker) and extends beyond 10 inches, making them taxonomically mollisols. This site is found on flat portions (slope 0-2%) on outwash plains and

terraces. Similarly, ponding of water to a depth of 15 inches occurs frequently for a range of duration between 2 and 30 days.

The characteristic vegetation of this site is of a tall-grass prairie that is dominated by prairie cordgrass, big bluestem, and a variety of sedge species. The combination of accumulation of organic material and seasonal changes in water which led to an increased probability of fire limited the encroachment of woody species. Fires occurred on this site every 5 years or less with the ignitions being a mix of lightning strikes and those set by Native Americans. During the dormant season, these fires were less frequent and of lower intensity and size than those that occurred during the growing season. Grazing by ungulates had an effect on the production and species diversity of this site, but the magnitude of the impact was less than that for prairies farther west. Reduction, or in most cases elimination, of fire as converted the site that of a woodland or forest dominated primarily by oak and hickory species. The understory would contain many of the prairie species until the canopy closed. Woody understory species would include sassafras, some willows, and dogwood species. Currently, most of this site is in agricultural production, with the majority being used to raise corn and soybeans after the installation of drainage, followed by tillage, and management.

Associated sites

R111XE402OH	Dry Outwash Mollisol Soils are somewhat poorly drained or dried
F111XE403OH	Outwash Upland Soil surface is lighter in color and can is very poorly to somewhat poorly drained
F111XE404OH	Dry Outwash Upland Soil surface is lighter in color and is moderately well drained or dried

Similar sites

R111XE402OH	Dry Outwash Mollisol Soils are somewhat poorly drained or dried
R111XE001OH	Mineral Muck Located on organic parent materials; located lower in the landscape.
R111XE002OH	Limnic Muck Located on organic parent materials; located lower in the landscape.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Spartina pectinata</i> (2) <i>Andropogon gerardii</i>

Physiographic features

This ecological site is found in outwash plain landscapes in MLRA 111E: Indiana and Ohio Till Plain, Eastern Part. Unique landforms that contain this site include depressions, flats, drainageways, and outwash plains and terraces. With slopes ranging from 0 to 2 percent.

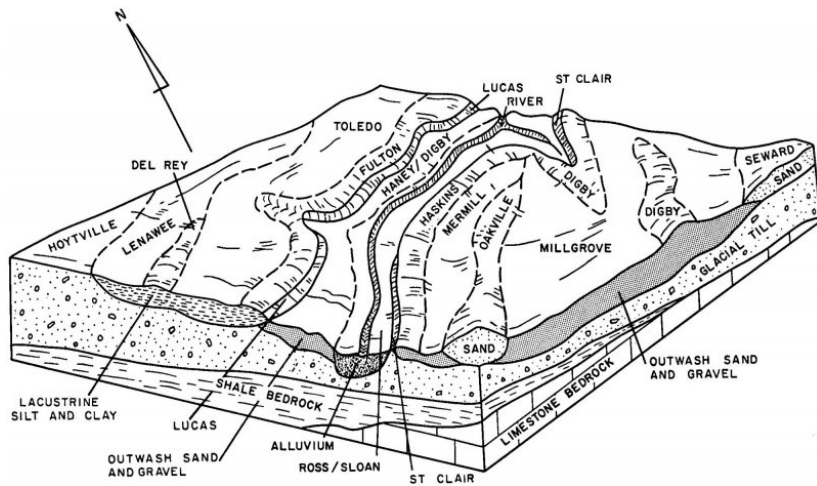


Figure 1. Block diagram showing soils on the landscape.

Table 2. Representative physiographic features

Landforms	(1) Depression (2) Flat (3) Drainageway (4) Outwash plain (5) Terrace
Flooding frequency	None
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	Occasional to frequent
Elevation	107–305 m
Slope	0–2%
Ponding depth	0–38 cm
Water table depth	0–15 cm
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation in this area is 35 to 41 (890 to 1,040 millimeters). Most of the rainfall occurs as convective thunderstorms during the growing season. About half or more of the precipitation occurs during the freeze-free period. Snowfall is common in winter. The average annual temperature is 48 to 52 degrees F (9 to 11 degrees C). The freeze-free period averages about 185 days and ranges from 165 to 205 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	132-144 days
Freeze-free period (characteristic range)	172-177 days
Precipitation total (characteristic range)	991-1,016 mm
Frost-free period (actual range)	128-146 days
Freeze-free period (actual range)	171-179 days
Precipitation total (actual range)	991-1,041 mm
Frost-free period (average)	138 days
Freeze-free period (average)	175 days
Precipitation total (average)	1,016 mm

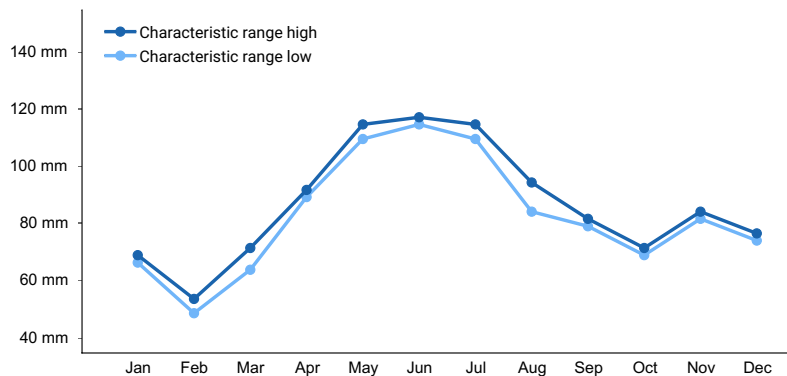


Figure 2. Monthly precipitation range

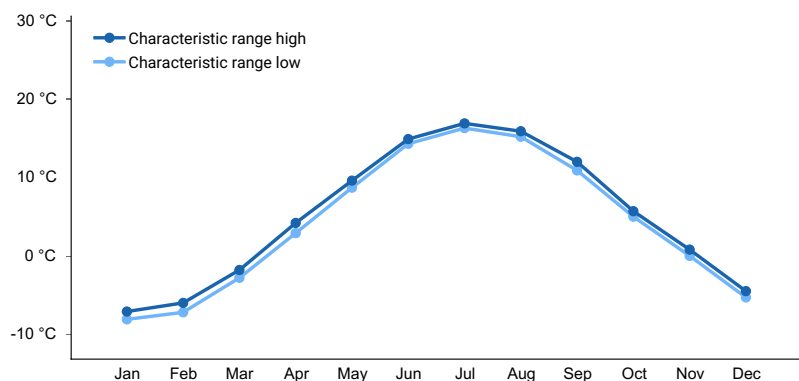


Figure 3. Monthly minimum temperature range

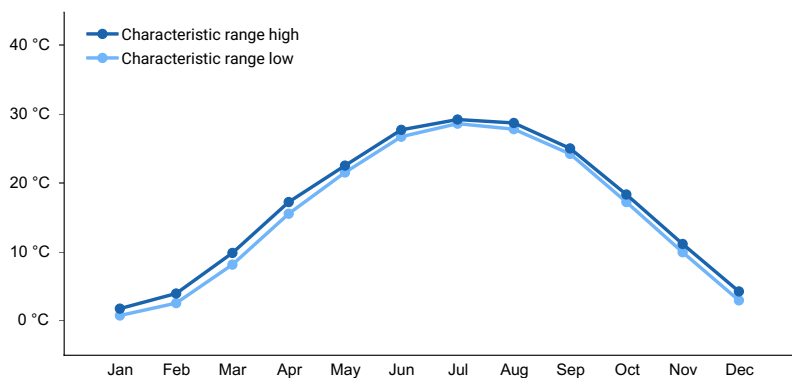


Figure 4. Monthly maximum temperature range

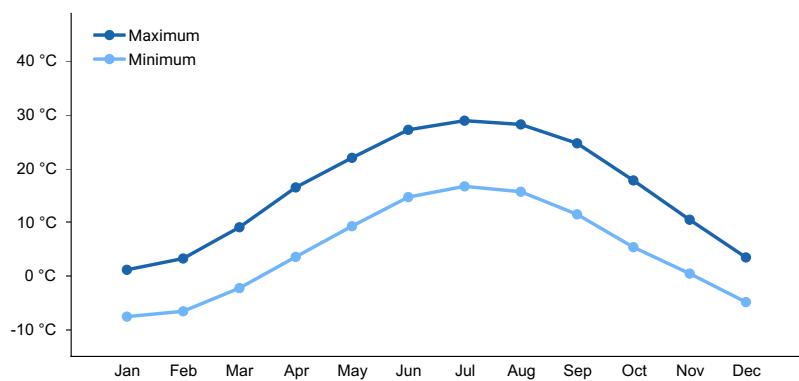


Figure 5. Monthly average minimum and maximum temperature

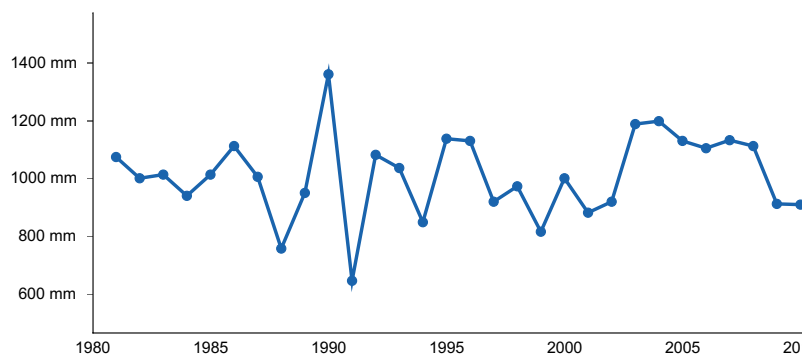


Figure 6. Annual precipitation pattern

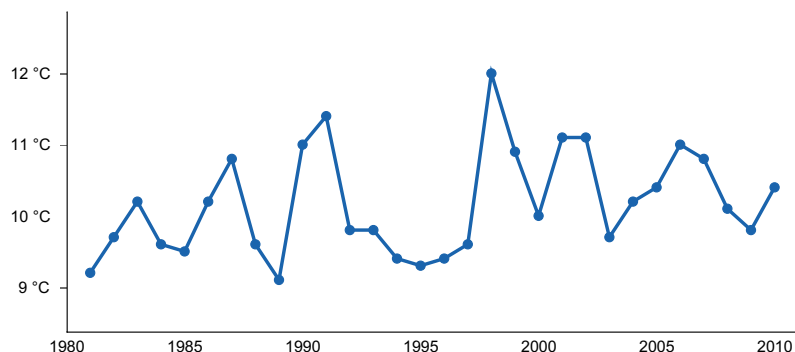


Figure 7. Annual average temperature pattern

Climate stations used

- (1) MARION 2 N [USC00334942], Marion, OH
- (2) GALION WTR WKS [USC00333021], Galion, OH
- (3) WESTERVILLE [USC00338951], Westerville, OH
- (4) BUCYRUS [USC00331072], Bucyrus, OH

Influencing water features

This ecological site is largely a recharge depressional wetland that receives water from precipitation, the surrounding uplands, and ground water discharge. A distinguishing characteristic of this site is the seasonal abundance (winter/spring) and lack of abundance (late summer) of water on the site creating annual wet and dry periods. Ponding occurs occasionally to frequently to a maximum average depth of 15 inches with a duration from brief (2 to 7 days) to long (7 to 30 days).

The hydrogeographic model classification for this site is DEPRESSIONAL: Outwash Plain, Loamy; herbaceous. This site has a Cowardin Classification of PEM1Cn; it is a persistent herbaceous vegetation palustrine site that is seasonally ponded on a mineral soil.

Soil features

The soil series associated with this site are: Westland, Millgrove. They are very deep very poorly drained, and moderate permeable soils, with slightly acidic to neutral soil reaction, that formed in outwash.

Parent Materials Kind: Outwash

Surface Texture: Clay loam, Silt Loam

Subsurface Texture group: Loamy



Figure 8. location of mapunits in the MRLA

Table 4. Representative soil features

Parent material	(1) Outwash
Surface texture	(1) Clay loam (2) Silt loam
Drainage class	Not specified
Permeability class	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (Depth not specified)	15.75–18.54 cm
Calcium carbonate equivalent (Depth not specified)	0–13%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	6.5–7
Subsurface fragment volume <=3" (Depth not specified)	2–19%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Table 5. Representative soil features (actual values)

Drainage class	Very poorly drained
Permeability class	Moderate
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	Not specified

Calcium carbonate equivalent (Depth not specified)	Not specified
Electrical conductivity (Depth not specified)	Not specified
Sodium adsorption ratio (Depth not specified)	Not specified
Soil reaction (1:1 water) (Depth not specified)	Not specified
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

The historic plant community of the Wet Outwash Mollisol ecological site is a wet prairie. This site is dominated by tall-grass prairie species that often reach 3-8 feet in height, particularly prairie cordgrass and big bluestem. Fluctuation of the amount of water on the site varies greatly, even over the course of a single year, which make the site prone to wildfires. The fluctuating water table, amount of organic material and cover, and fires maintain the herbaceous dominance of the site to the exclusion of trees.

State and transition model

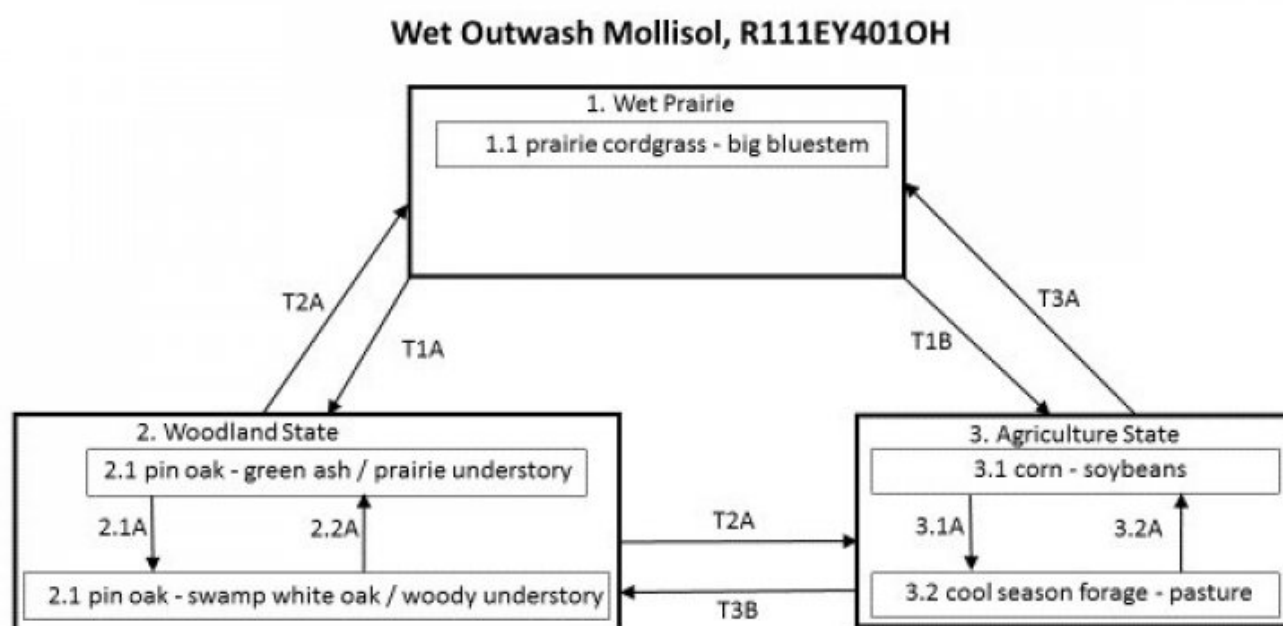


Figure 9. STM

Wet Outwash Mollisol, R111EY401OH

Diagram Legend

T1A	No woody species management, no fire
T1B	Drainage, site preparation, planting, management
T2A	Tree removal, fire
T2B	Remove woody species, drainage, site preparation, planting, management
T3A	Remove drainage, planting, fire
T3B	Remove drainage, planting, no fire
2.1A	Succession, no fire
2.2A	Selective tree harvest
3.1A	Pasture/forage planting and maintenance
3.2A	Tillage/no-till planting and management of row crops.

Figure 10. Legend

State 1

West Prairie

This is the reference or diagnostic plant community for this site. In reference condition, this site was dominated by tall prairie grass, principally big bluestem, prairie cordgrass, and bluejoint grass. Secondary forb species include dense blazing star and Virginia mountainmint as two of the more abundant. Herbaceous species dominance was maintained by a, mostly annual, wet and dry cycle and fire.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- prairie cordgrass (*Spartina pectinata*), grass

Community 1.1

prairie cordgrass - big bluestem

This phase is characterized by dominance of tall-prairie grasses. Periodic wet and dry soil periods along with fire maintain this phase. Absence of fire allows for woody species to invade and given enough time become dominant

Dominant plant species

- prairie cordgrass (*Spartina pectinata*), grass
- big bluestem (*Andropogon gerardii*), grass

State 2

Woodland State

Absence of fire or lack of woody species management will move this site to a woodland state dominated by oak species, specifically pin oak and swamp white oak. The understory would contain many of the prairie species until the canopy closed. Woody understory species would include sassafras.

Dominant plant species

- pin oak (*Quercus palustris*), tree
- swamp white oak (*Quercus bicolor*), tree

Community 2.1

pin oak - green ash

This phase is characterized by the absence of fire. Trees have become the dominant growth form on the site. The understory still contains some prairie herbaceous species at the lower tree canopy levels, but they all but disappear at the higher levels.

Dominant plant species

- pin oak (*Quercus palustris*), tree
- green ash (*Fraxinus pennsylvanica*), tree

Community 2.2

pin oak - swamp white oak

This phase is characterized by the absence of fire. Trees remain the dominant growth form. Swamp white oak becomes present in the canopy. The understory is occupied mostly by woody species.

Dominant plant species

- pin oak (*Quercus palustris*), tree
- swamp white oak (*Quercus bicolor*), tree

Pathway P2.1A

Community 2.1 to 2.2

No management; no fire.

Pathway P2.2A

Community 2.2 to 2.1

Prescribed timber harvest and timber stand improvement practices.

State 3

Agricultural State

This site has largely been converted to agricultural use. Most of the historic acres are now in row crop agricultural use. Most common is a corn and soybean rotation of various types.

Community 3.1

Row Crops (corn - soybeans)

This phase is characterized by row crop agriculture, primarily corn and soybeans.

Community 3.2

Cool season forage - pasture

This phase is characterized by forage or grazing agriculture. Different mixes of, generally, cool season grasses and forbs, largely clovers, are grown.

Pathway P3.1A

Community 3.1 to 3.2

Planting of cool season pasture/forage species and management.

Pathway P3.2A

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

Transition T1A

State 1 to 2

No fire or woody species management of any type.

Transition T1B

State 1 to 3

Install soil drainage, tillage and regular agricultural practices.

Restoration pathway R2A

State 2 to 1

Remove all trees and woody vegetation, seeding, and fire restores the site to the reference state (1).

Transition T2B

State 2 to 3

Removal of the trees, installation of drainage system, tillage and planting of the crop move this site to the agriculture state (3).

Restoration pathway R3A

State 3 to 1

Remove drainage, site preparation, planting, and regular application of fire.

Restoration pathway T3B

State 3 to 2

Remove drainage, plant trees, implement forestry practices that do not include fire.

Additional community tables

Inventory data references

Site concept developed through expert opinion, review of the literature, and field reconnaissance.

Other references

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Approval

Chris Tecklenburg, 5/28/2020

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)	TYLER STAGGS
Contact for lead author	
Date	05/19/2024
Approved by	Chris Tecklenburg
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:**
-