USDA Natural Resources
Conservation Service

# Ecological site F089XY014WI
# Moist Loamy Uplands

Last updated: 9/27/2023
Accessed: 04/29/2024

## 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): 089X–Wisconsin Central Sands

The Wisconsin Central Sands (MLRA 89) corresponds closely to Central Sand Plains Ecological Landscape published by the Wisconsin Department of Natural Resources (WDNR, 2015). Much of the following brief overview of this MLRA is borrowed from that publication.

The Wisconsin Central Sands MLRA is entirely in Wisconsin. The total land area is 2,187,100 acres (3,420 square miles, 8858 square kilometers). It is bordered to the east by Johnstown-Hancock end moraines, which were pushed to their extent by the west side of the Green Bay Lobe (Clayton & Attig, 1999). It is bordered to the southwest by highly eroded, unglaciated valleys and ridges. The dominant feature of this MLRA is the remarkably flat, sandy plain, composed of lacustrine deposits and outwash sand, that was once the main basin of Glacial Lake Wisconsin. It also features extensive pine and oak barrens and wetland complexes.

Glacial Lake Wisconsin was fed primarily by glacial meltwater from the north and east. The lake deposited silt overlain by tens of meters of sand (Clayton & Attig, 1989). The silty layers are closer to the surface in some areas, where they impede drainage and contribute to the formation of extensive wetland complexes. It is believed that Glacial Lake Wisconsin drained within several days after a breach in the ice dam that supported it. The catastrophic flood that followed flowed to the south and carved the scattered buttes and mesas protruding from the sandy plain in the southern portion of this MLRA. Before vegetation established after glacial recession, strong winds formed aeolian sand dunes that now support xeric pine and oak stands within the Wisconsin Central Sands.

The surface of the northwestern portion is mostly undulating. The sandy surface sediment was mostly deposited by meltwater during the Wisconsin glaciation. Gentle hills are a result of underlying bedrock topography. Valleys and floodplains are formed by stream action. The underlying bedrock controls the water table elevation and contributes to the formation of numerous wetlands.

Historically, the Wisconsin Central Sands were dominated by large wetland complexes, sand prairies, and oak forests, savannas, and barrens. Some pine and hemlock forests were found in the northwest portion. The Wisconsin Central Sands was subject to frequent fires, leading to today’s need for prescribed burns to maintain a representation of fire-dependent communities.

## Classification relationships

Major Land Resource Area (MLRA): Wisconsin Central Sands (89)
USFS Subregions: Central Wisconsin Sand Plain (222Ra)
Small sections occur in the Neillsville Sandstone Plateau (222Rb) Subregions.

## Ecological site concept

The Moist Loamy Uplands ecological site is found on depressions and drainageways on lake plains, stream

terraces, and pediments, primarily along the southwest boundary where MLRA 89 borders the Driftless region. These sites are characterized by very deep, somewhat poorly drained soils formed in loamy alluvium and silty lacustrine deposits. Some sites have underlying sandy alluvium or clayey lacustrine deposits. Precipitation, runoff from adjacent uplands, and groundwater discharge are the primary sources of water. Soils range from strongly acid to moderately alkaline.

Moist Loamy Uplands differs from other sites by its deep loamy deposits and somewhat poorly drained soils. The deep deposits set this site apart from Moist Loamy Bedrock Uplands. Other somewhat poorly drained sites have sandy or clayey textures. Loamy textures tend to have higher pH and available water capacity than sand, but less than clay. The somewhat poor drainage sets this site apart from other loamy sites. While soils are classified as somewhat poorly drained, this condition does not appear to dominate the landscape. Plant communities are characterized primarily by mesophytic species while a few members of typically wetter communities occur only sporadically.

The exact nature of pre-European settlement vegetation is difficult to assess at the scale of this Ecological Site. Natural disturbances and activities of native peoples no doubt produced a mosaic of plant community types. However, based on our understanding of ecological characteristics of species currently occupying these sites we can make estimates of the nature of ecological states and transitions that we might expect under current conditions. Seven tree species have been recorder in our sampling of two representative sites: Trembling aspen (Populus tremuloides),), red maple (A. rubrum), white oak (*Q. alba*), white ash (Fraxinus Americana), ironwood (Ostrya virginiana), boxelder (*Acer negundo*) and sugar maple (A. saccharum).

## Associated sites

| | |
|---|---|
| F089XY001WI | **Acidic Poor Fen**<br>Acidic Poor Fens sites consist of deep herbaceous organic materials. They are very poorly drained and remain saturated throughout the year. They are strongly to extremely acidic. These sites are wetlands. These sites are found primarily in the western half of the Wisconsin Central Sands MLRA. They may occur lower in the drainage sequence and are much wetter than Moist Loamy Uplands. |
| F089XY002WI | **Mucky Swamps**<br>Mucky Swamps sites consist of herbaceous organic materials sometimes underlain by sandy to loamy mineral soil. They are very poorly drained and remain saturated throughout much of the year. These sites are wetlands. They may occur lower in the drainage sequence and are much wetter than Moist Loamy Uplands. |
| F089XY004WI | **Loamy Floodplains**<br>Loamy Floodplains are found exclusively on floodplains in loamy alluvium underlain by sandy alluvium. Soils are somewhat poorly to poorly drained and are subject to flooding. These sites occur primarily along tributaries to the Yellow River in central Wood County and along the Lemonweir River. They may be adjacent to Moist Loamy Uplands. |
| F089XY020WI | **Loamy Uplands**<br>Loamy Uplands consist of deep sandy deposits underlain by clayey lacustrine deposits or loamy alluvium underlain by sandy outwash. They are moderately well to somewhat excessively drained. They occur higher on the drainage sequence and are drier than Moist Loamy Uplands. |

## Similar sites

| | |
|---|---|
| F089XY013WI | **Moist Loamy Bedrock Uplands**<br>Moist Loamy Bedrock Uplands form in loamy alluvium or loess underlain by loamy or clayey residuum weathered from interbedded sandstone and shale. Bedrock is found within 48 inches (122 cm) of the surface. These soils are somewhat poorly drained and are subject to neither flooding nor ponding. These sites are found in northern portion of the Wisconsin Central Sands MLRA where depth to bedrock is shallow. Some of the vegetative communities supported by these sites are also found on Moist Loamy Uplands. |
| F089XY004WI | **Loamy Floodplains**<br>Loamy Floodplains are found exclusively on floodplains in loamy alluvium underlain by sandy alluvium. Soils are somewhat poorly to poorly drained and are subject to flooding. These sites occur primarily along tributaries to the Yellow River in central Wood County and along the Lemonweir River. Their vegetative communities may be similar to those of Moist Loamy Uplands. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Acer rubrum*<br>(2) *Acer saccharum* |
| Shrub | (1) *Cornus* |
| Herbaceous | (1) *Impatiens capensis* |

## Physiographic features

These sites formed in depressions and drainageways on stream terraces and glacial lake basins. Slopes range from 0 to 3 percent. Elevation ranges from 705 to 1,394 feet (215 to 425 meters) above sea level. These sites are not subject to ponding or flooding. Some sites have an apparent seasonally high water table (endosaturation) at depth of 18 to 24 inches (46 to 61 cm), but the water table can drop to 60 inches (150) cm during dry conditions. Surface runoff is low.

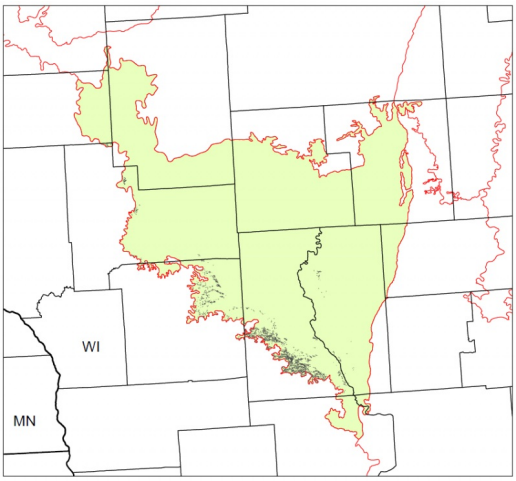



**Figure 1. Distribution of Moist Loamy Uplands in the Wisconsin Central Sands MLRA (89).**

**Table 2. Representative physiographic features**

| | |
|---|---|
| Slope shape across | (1) Linear |
| Slope shape up-down | (1) Concave |
| Hillslope profile | (1) Footslope |
| Landforms | (1) Lake plain<br>(2) Terrace |
| Runoff class | Low |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 705–1,394 ft |
| Slope | 0–3% |
| Water table depth | 18–24 in |
| Aspect | Aspect is not a significant factor |

## Climatic features

The continental climate of the Wisconsin Central Sands is typical of the southern half of the state – cold winters and warm summers. Precipitation is well-distributed throughout the year with a slight peak in the summer months. Snowfall covers the ground from late fall to early spring. The soil moisture regime of MLRA 89 is udic (humid climate). The soil temperature regime is mostly frigid, with a small portion of mesic in the southern tip. Neither precipitation nor temperature vary greatly across this MLRA. More so than latitude, local topography seems to be an

important predictor of growing season length, with fewer growing degree days in lower-lying areas.

This site is represented by two NOAA weather stations – Black River Falls Sewage and Mauston 1 SE, recorded 1981 to 2010. Neither of these stations are located on the site itself.

The average annual precipitation for this ecological site is 33 inches. The average annual snowfall is 48 inches. The annual average maximum and minimum temperatures are 56°F and 35°F, respectively.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (characteristic range) | 101-119 days |
| Freeze-free period (characteristic range) | 136-146 days |
| Precipitation total (characteristic range) | 33-34 in |
| Frost-free period (actual range) | 97-124 days |
| Freeze-free period (actual range) | 133-149 days |
| Precipitation total (actual range) | 33-34 in |
| Frost-free period (average) | 110 days |
| Freeze-free period (average) | 141 days |
| Precipitation total (average) | 33 in |

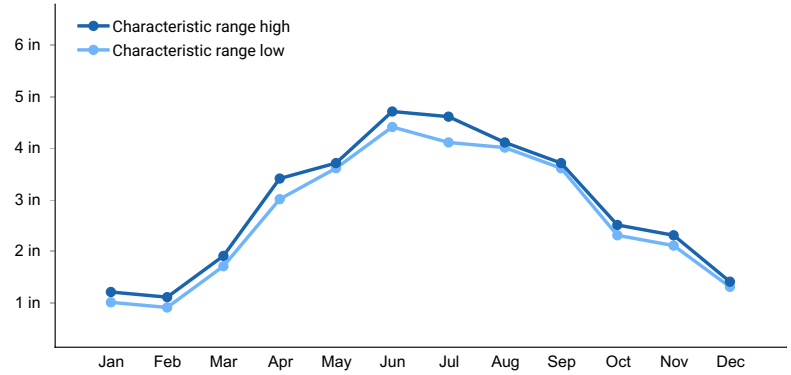



**Figure 2. Monthly precipitation range**

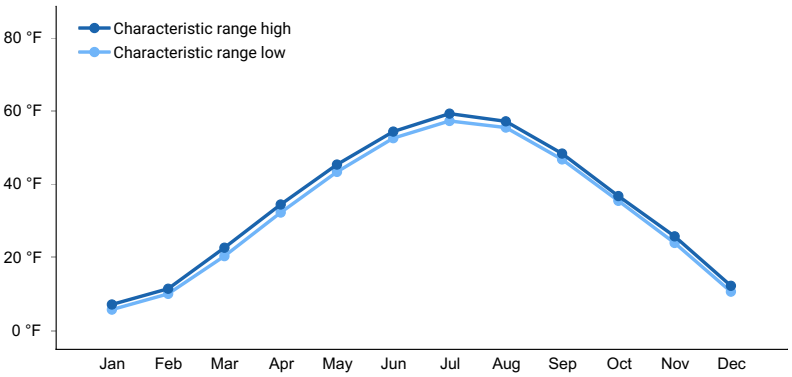



**Figure 3. Monthly minimum temperature range**

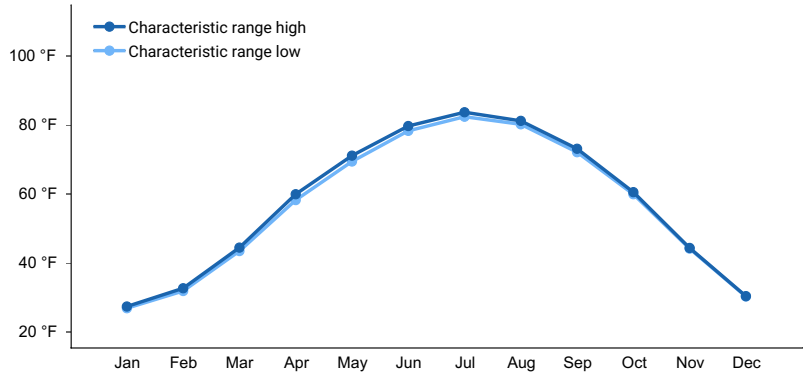



**Figure 4. Monthly maximum temperature range**

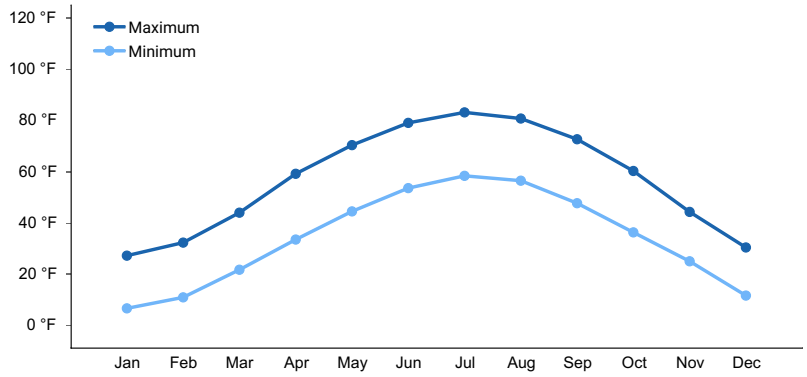



**Figure 5. Monthly average minimum and maximum temperature**

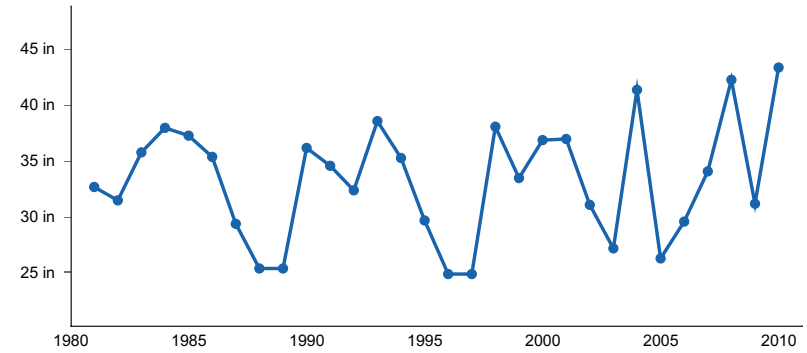



**Figure 6. Annual precipitation pattern**

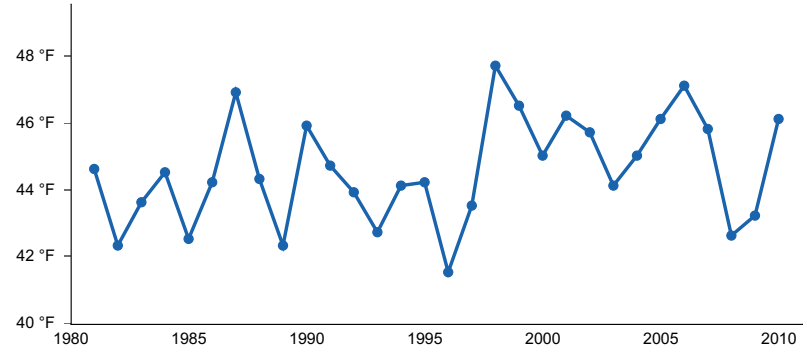



**Figure 7. Annual average temperature pattern**

## Climate stations used

- (1) MAUSTON 1 SE [USC00475178], Mauston, WI
- (2) NECEDAH [USC00475786], Necedah, WI

## Influencing water features

Water is received through precipitation, runoff from adjacent uplands, groundwater discharge, and, rarely, stream inflow. Water levels are greatly influenced by precipitation rates and runoff from upland sites. Water leaves the site primarily through runoff, evapotranspiration, and groundwater recharge. Permeability of these sites is impermeable or moderately slow. Hydrologic group is A or C/D.

## Soil features

These sites are represented by the Curran, Dunnville variant, Hoop, Kibbie, Korobago, and Sooner soil series. The Curran series is classified as a Udollic Endoaqualf; Dunnville variant is an Aquic Hapludoll; Hoop, Kibbie, and Sooner are Aquollic Hapludalfs; Korobago is an Aquic Eutrudept.

These sites formed in loamy alluvium underlain by either sandy alluvium or clayey lacustrine deposits. Soils are somewhat poorly drained. They do not meet hydric soil requirements. The surface texture of these sites is sandy loam or very fine sandy loam. Subsurface textures consist of silt loam, silty clay, very fine sand, and fine sand. Soil pH ranges from strongly acid to moderately alkaline with values of 5.5 to 7.9. Surface fragments are absent. Subsurface fragments less than 3 inches may be present up to 7 percent volume. Carbonates can be present up to 18 percent beginning at 29 inches (74 cm).

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Alluvium<br>(2) Lacustrine deposits |
| Surface texture | (1) Sandy loam<br>(2) Silt loam |
| Drainage class | Somewhat poorly drained |
| Permeability class | Very slow to moderately slow |
| Soil depth | 78 in |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-60in) | 5.45–11.09 in |
| Calcium carbonate equivalent (0-40in) | 0–18% |
| Soil reaction (1:1 water) (0-40in) | 5.5–7.9 |
| Subsurface fragment volume <=3" (0-78in) | 0–7% |
| Subsurface fragment volume >3" (0-78in) | 0% |

## Ecological dynamics

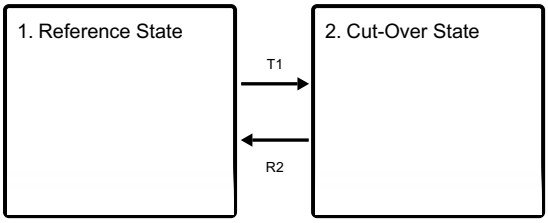
Soils on this Ecological Site can support a relatively large number of deciduous tree species, while conifers, except for white pine, are typically absent. By far, the most successful species, in terms of regeneration capacity and potential as a permanent component of the community, is red maple. Boxelder is a common associate in young stands, but it is a relatively small tree and does not compete well in the overstory with the maples. In the past, trembling aspen sometimes invaded cut-over and burned sites, but such conditions seldom occur today, due to efficient fire prevention and suppression. White oak and red oak are occasional associate in early-successional stands, while ironwood is a commonly present in older communities due to its high shade tolerance.

It is almost certain that present species composition on this ecological site is largely due to past fire disturbance. Soil characteristics and understory flora suggest that shade-tolerant mesic hardwoods are well suited for occupying

these sites but are currently rare or absent simply because of lack of adequate seed source. We can expect that with time and absence of fire disturbance sugar maple, basswood and white ash will again attain dominance in these forest communities.

## State and transition model

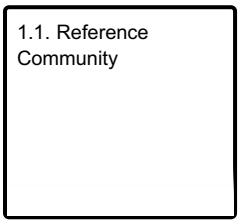
**Ecosystem states**



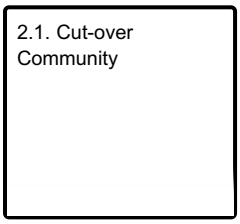

**T1** - Clear cut; severe disturbance

**R2** - Time; succession; increase in maples

**State 1 submodel, plant communities**




**State 2 submodel, plant communities**




## State 1
## Reference State

In absence of reliable data on historic composition of plant communities, the reference state described is the current forest community that appears to be in a mid-successional development. Such a community is dominated, both in the canopy and the reproductive layer, by red maple. Common associates are boxelder (*Acer negundo*), white oak (*Quercus alba*) and black cherry (*Prunus serotina*). Sugar maple is sometimes also present, but no stands, where it dominates, have been observed. Red maple typically is well represented in the seedling/sapling layer and is often accompanied by shrubs, especially dogwoods (Cornus spp.) and, in wetter locations, by winterberry (*Ilex verticillata*). The herbaceous layer consists of many species common to mesic forests, but it includes a number of species reflecting the somewhat poorly drained conditions, e.g. Jewelweed (*Impatiens capensis*), stinging nettle (*Urtica dioica*), sensitive fern (*Onoclea sensibilis*) and occasionally even marsh marigold (*Caltha palustris*).

### Dominant plant species

- red maple (*Acer rubrum*), tree
- boxelder (*Acer negundo*), tree
- black cherry (*Prunus serotina*), tree
- white oak (*Quercus alba*), tree
- dogwood (*Cornus*), shrub
- jewelweed (*Impatiens capensis*), other herbaceous
- stinging nettle (*Urtica dioica*), other herbaceous
- sensitive fern (*Onoclea sensibilis*), other herbaceous

### Community 1.1
### Reference Community

This community is often dominated by red maple, boxelder, wild black cherry, and white oak. Sugar maple may also be on site.

#### Dominant plant species

- red maple (*Acer rubrum*), tree
- boxelder (*Acer negundo*), tree
- black cherry (*Prunus serotina*), tree
- white oak (*Quercus alba*), tree
- dogwood (*Cornus*), shrub
- jewelweed (*Impatiens capensis*), other herbaceous
- stinging nettle (*Urtica dioica*), other herbaceous
- sensitive fern (*Onoclea sensibilis*), other herbaceous

## State 2
## Cut-Over State

If conditions described in Transition 1 are met, an aspen community may become established. This community may include scattered individuals of red or white oak, black cherry (*Prunus serotina*), white pine, as well as boxelder.

#### Dominant plant species

- quaking aspen (*Populus tremuloides*), tree
- boxelder (*Acer negundo*), tree
- red maple (*Acer rubrum*), tree
- dogwood (*Cornus*), shrub
- jewelweed (*Impatiens capensis*), other herbaceous

### Community 2.1
### Cut-over Community

This community has incurred clear cutting or a severe canopy altering disturbance. Quaking aspen will initially dominant post-disturbance. Also on site will be boxelder, red maple, and oak.

#### Dominant plant species

- quaking aspen (*Populus tremuloides*), tree
- boxelder (*Acer negundo*), tree
- red maple (*Acer rubrum*), tree
- oak (*Quercus*), tree

## Transition T1
## State 1 to 2

This transition represents a stand replacing natural disturbance or clear cutting.

## Restoration pathway R2
## State 2 to 1

In absence of clearcutting, or severe natural disturbance, aspen community is invaded by shade-tolerant maples and reverts to reference state conditions within 50 to 100 years.

## Additional community tables

## Inventory data references

Plot and other supporting inventory data for site identification and community phases is located on a NRCS North Central Region shared and one drive folder. University Wisconsin-Stevens Point described soils, took photographs, and inventoried vegetation data at community phases within the reference state. The data sources include WI ESD Plot Data Collection Form - Tier 2, Releve Method, NASIS pedon description, NRCS SOI 036, photographs, and Kotar Habitat Types.

## Other references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## Approval

Suzanne Mayne-Kinney, 9/27/2023

## 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 | 09/27/2023 |
| 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):**

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

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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:**

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