Ecological site F105XY002WI
Wet Sandy Floodplain

Last updated: 2/23/2024
Accessed: 05/18/2024

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): 105X–Upper Mississippi River Bedrock Controlled Uplands and Valleys

The Northern Mississippi Valley Loess Hills MLRA area corresponds closely to the Western Coulees and Ridges and Southwest Savanna Ecological Landscapes. Some of the following brief overview is borrowed from the Wisconsin Department of Natural Resources Ecological Landscape publication (2015).

Fifty-two percent of the Upper Mississippi River Bedrock Controlled Uplands and Valleys MLRA is in Wisconsin; Iowa, Minnesota, and Illinois contain the rest. This region is the only area in Wisconsin that has not been covered by glaciers within the past 2.4 million years. The Wisconsin portion of this MLRA is approximately 7.4 million acres (11,600 square miles). The landscape is characterized by dissected topography with deeply-incised, steep-walled valleys between bedrock controlled ridges.

Though it’s called the “Driftless Region”, some glacial drift is found in the major river valleys of this region in the form of outwash, deposited by proglacial streams of glacial meltwater. Wisconsin’s most recent glaciations also impacted the sediment of the area through the deposition of loess. After the glacier receded and before vegetation established, the bare surfaces of the glaciated areas were highly susceptible to wind erosion. As a result, a veneer of loess (wind-blown silt) was deposited over the entire region. The thickest deposits—nearly five meters—are on ridges near the Mississippi River and gradually thin moving eastward. The loess caps in Dane and Green counties are generally 0.5-1.5 meters deep. Much of the loess has eroded downslope and collected in floodplains.

Bedrock is shallow throughout this MLRA and is a major influence on topography and hydrology. Most of the MLRA has bedrock within two meters, except in the deep river valleys that are filled with outwash and alluvium materials. Sandstone is the dominant bedrock type in MLRA 105, but the southernmost portion is dominated by dolomite. Military Ridge is an escarpment that straddles the boundary between sandstone and dolomite bedrock. The sandstone north of the ridge is weaker than the erosion-resistant dolomite south of the ridge. The sandstone is deeply cut and dissected into steep slopes and valleys. The dolomite-controlled ridges tend to be less dissected and broader with more gentle, south sloping topography. Geomorphic and fluvial processes formed these landscapes by way of sheet wash, soil creep, and flowage. These processes eroded the hillslopes, cut into bedrock, and transported the debris to streams, forming floodplains and terraces.

Underfit streams are common in MLRA 105, especially in the southern portion. These streams currently occupy large river valleys—especially those of the Black, Chippewa, Mississippi, and Wisconsin Rivers—that were carved by proglacial meltwater streams carrying much larger quantities of water than what’s present today. As the climate dried, waterflow decreased and the valleys filled with alluvial sediment. Narrow meanders were formed by the shrinking streams and are often dissimilar to the meanders of the larger valleys they occupy. Fluvial landforms – including terraces, oxbow lakes, sandbars, eroding bluffs, and large floodplain complexes – are found within these large valleys and are subject to varying flooding frequencies, intensities, and durations.
Karst topography formed in this region from dissolution of carbonate bedrock by surface and groundwater. Dolomite and limestone are more easily affected by dissolution, but karst topography also formed in sandstone. Erosion by water (stream meanders, rain/runoff, and groundwater), wind, and frost weaken joints and bedding planes that can

cause collapse. In addition, sandstone materials collapse into cavities in underlying dolomite or limestone.

Historically, MLRA 105 was dominated by oak forests and oak openings making up more than 50% of the area. Prairies were significant and covered 32% of the area south of Military Ridge. Maple-basswood forests covered 19% of the area north of Military Ridge. Dominant tree species were white oak (Quercus alba), bur oak (Quercus macrocarpa), black oak (Quercus velutina), and sugar maple (Acer saccharum).

Classification relationships

Relationship to Established Framework and Classification Systems:

Habitat Types of S. Wisconsin (Kotar, 1996): No Wetland Forest Habitat Types exist for the region, but it is likely to be a *Fraxinus nigra*-Acer rubrum/Impatiens type.

Biophysical Settings (Landfire, 2014): This ES is largely mapped as Central Interior and Appalachian Floodplain Forest, Central Interior and Appalachian Floodplain Shrubland, and Central Interior and Appalachian Shrub Wetlands.

Hierarchical Framework Relationships:

Major Land Resource Area (MLRA): Upper Mississippi River Bedrock Controlled Uplands and Valleys (105)

USFS Subregions: Menominee Eroded Pre-Wisconsin Till (222La), Melrose Oak Forest and Savannah (222Lb), Mississippi-Wisconsin River Ravines (222Lc)

Wisconsin DNR Ecological Landscapes: Western Coulee and Ridges

Ecological site concept

Wet Sandy Floodplains account for approximately 140,000 acres of MLRA 105, or about 2% of total land area. They are often found in the wide river valleys of the Chippewa, Black, and Wisconsin Rivers, which carried large loads of sandy and gravelly outwash and during the Late Wisconsin glaciation. The soils consist of very deep, sandy and loamy deposits of outwash and alluvium. They are subject to flooding, primarily in the spring and fall. Their primary water source is stream overflow but precipitation, runoff from adjacent uplands, and groundwater discharge are also significant waters sources.

Associated sites

F105XY009WI	**Sandy Upland** These sites form in deep sandy materials deposits by water and wind. They are moderately well to somewhat excessively drained. They are sometimes found adjacent to Wet Sandy Floodplains on higher-elevation outwash terraces.
R105XY018WI	**Dry Mollic or Umbric Upland** These sites form in sandy materials deposited by wind, water, or weathered from sandstone bedrock. They have deep, dark surfaces. They are moderately well to excessively drained. They are often found adjacent to Wet Sandy Floodplains on higher-elevation outwash terraces.
F105XY019WI	**Dry Upland** These sites form in sandy materials deposited by wind, water, gravity, or weathered from sandstone bedrock. They are well drained to excessively drained. They are often frequently adjacent to Wet Sandy Floodplains on higher-elevation outwash terraces.

Similar sites

F105XY003WI	**Wet Loamy-Clayey Floodplain** These sites form in deep, loamy alluvium deposits along floodplains, especially those along smaller tributaries to the Chippewa, Black, and Wisconsin rivers. Like Wet Sandy Floodplains, they are sometimes saturated long enough for hydric conditions to occur and will support vegetation tolerant of seasonal flooding, though they have a higher nutrient status.

F105XY004WI	**Wet Sandy Lowland** These sites form in depressions and drainageway in deep, sandy outwash deposits. They are very poorly or poorly drained and are saturated long enough for hydric conditions to occur. They may sometimes host vegetative communities similar to those found in Wet Sandy Floodplains.

Table 1. Dominant plant species

Tree	(1) *Fraxinus nigra* (2) *Ulmus*
Shrub	(1) *Alnus incana* (2) *Cornus*
Herbaceous	(1) *Carex* (2) *Impatiens capensis*

Physiographic features

These sites occur on sandy floodplains. Landform shape is linear. Slopes range from 0 to 3 percent. Elevation of the landform ranges from 705 to 1001 feet (215 to 305 meters) above sea level. These sites are subject to very rare to frequent flooding. Some sites may also be subject to brief ponding. The apparent seasonally high water table (endosaturation) may be found throughout the soil profile. Runoff potential is negligible to very low.

Table 2. Representative physiographic features

Hillslope profile	(1) Toeslope
Slope shape across	(1) Linear
Landforms	(1) Flood plain
Runoff class	Negligible to very low
Flooding duration	Very brief (4 to 48 hours) to long (7 to 30 days)
Flooding frequency	Very rare to frequent
Ponding duration	Brief (2 to 7 days)
Ponding frequency	None to frequent
Elevation	215–305 m
Slope	0–3%
Ponding depth	0–30 cm
Water table depth	0–145 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate of the Upper Mississippi River Bedrock Controlled Uplands and Valleys MLRA is typical of southern Wisconsin, with warmer winters, warmer summers, and higher precipitation rates than MLRA in northern Wisconsin. The MLRA stretches over about 2.9 degrees of latitude, or nearly 200 miles, from its northern tip in Barron county to its southern Wisconsin extent on the border of Illinois. This results in considerable variation in climate throughout the MLRA. The growing season ranges from 117 to 181 growing degree days, with longer growing seasons in the southern portion.

Table 3. Representative climatic features

Frost-free period (characteristic range)	116-124 days
Freeze-free period (characteristic range)	136-151 days
Precipitation total (characteristic range)	864-889 mm
Frost-free period (actual range)	112-129 days

Freeze-free period (actual range)	131-153 days
Precipitation total (actual range)	813-889 mm
Frost-free period (average)	120 days
Freeze-free period (average)	144 days
Precipitation total (average)	864 mm

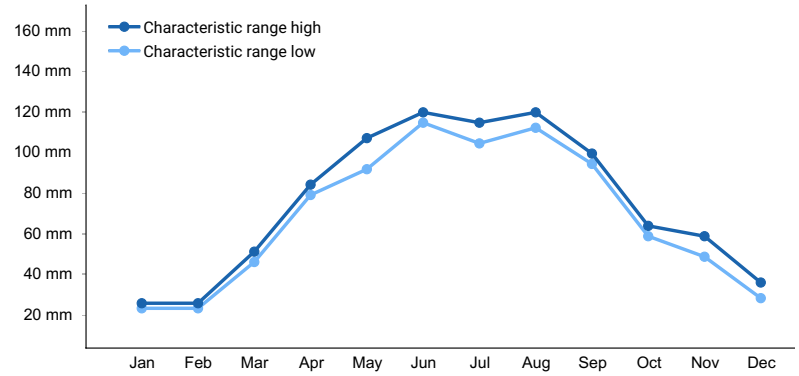


Figure 1. Monthly precipitation range

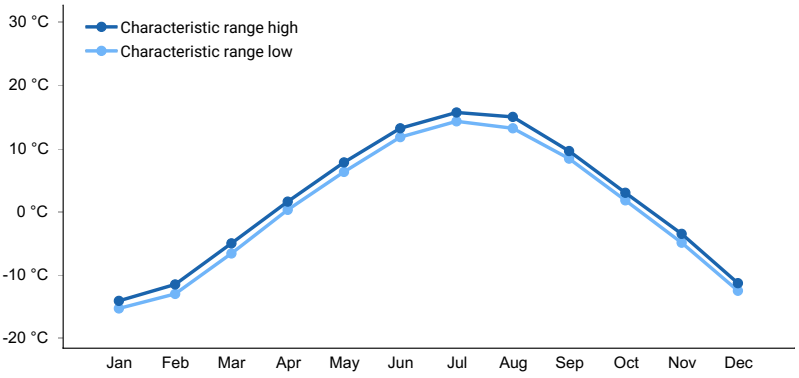


Figure 2. Monthly minimum temperature range

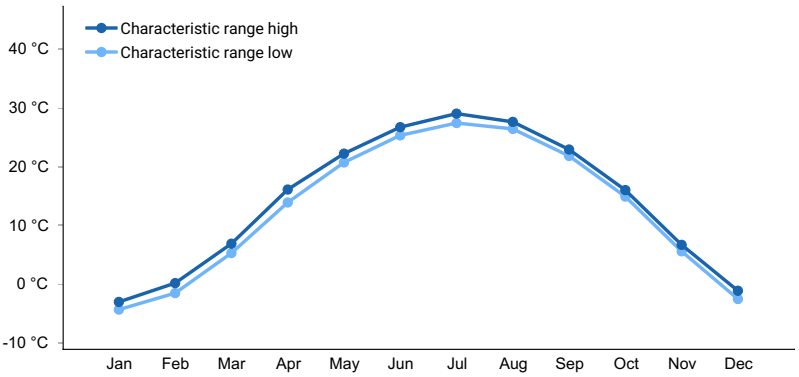


Figure 3. Monthly maximum temperature range

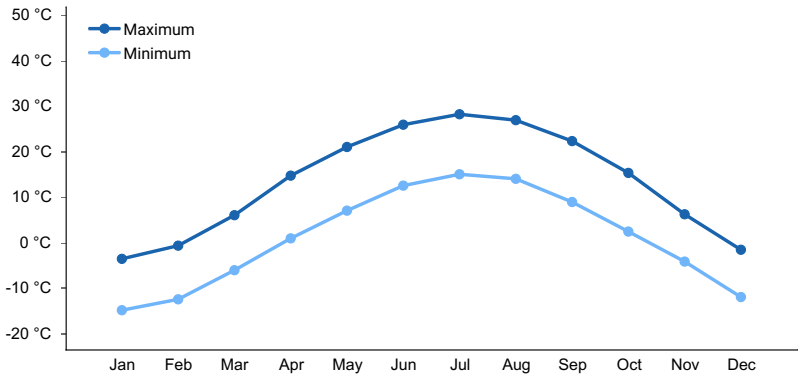


Figure 4. Monthly average minimum and maximum temperature

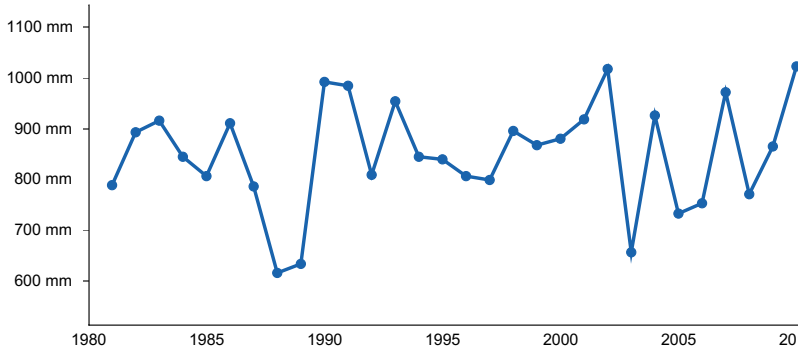


Figure 5. Annual precipitation pattern

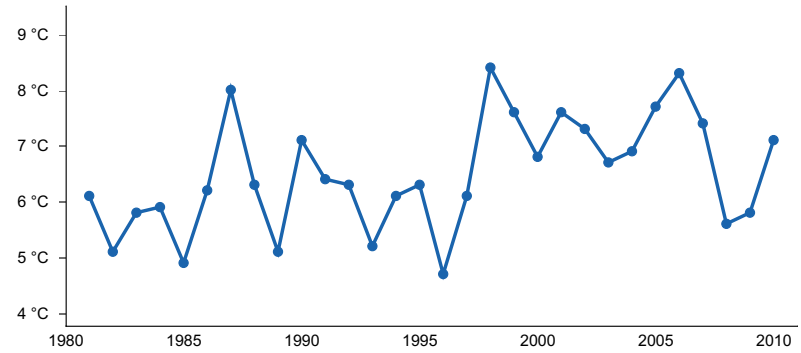


Figure 6. Annual average temperature pattern

Climate stations used

- (1) RIDGELAND 1 NNE [USC00477174], Dallas, WI
- (2) MONDOVI [USC00475563], Mondovi, WI
- (3) DURAND [USC00472279], Durand, WI
- (4) MENOMONIE [USC00475335], Menomonie, WI
- (5) SPARTA [USC00477997], Sparta, WI
- (6) BOSCOBEL AP [USW00094994], Boscobel, WI

Influencing water features

Water is received primarily through precipitation, runoff from adjacent uplands, stream inflow, and groundwater discharge. Water levels are greatly influenced by rates of precipitation and runoff from upland sites. Water leaves the site primarily through stream outflow, subsurface outflow, runoff, evapotranspiration, and groundwater recharge. Some sites may be wetlands.

Flooding from stream inflow is a significant factor in the ecological development of floodplain sites. On most sites, the vegetation must be tolerant of frequent flooding that may persist for a month.

Under the Cowardin System of Wetland Classification, or National Wetlands Inventory (NWI), the wetlands can be classified as:
1) Palustrine, forested, broad-leaved deciduous, saturated, or
2) Palustrine, forested, needle-leaved evergreen, saturated, or
3) Palustrine, scrub-shrub, broad-leaved deciduous, saturated

Under the Hydrogeomorphic Classification System (HGM), the wetlands can be classified as:
1) Riverine depression, forested, sandy
Permeability of the soil is slow to moderately rapid. The hydrologic group for this site is A or A/D.

Wetland description

Hydrologic Group: A, A/D
Hydrogeomorphic Wetland Classification: Riverine depression, forested, sandy

Soil features

This site is made up of the Absco, Algansee, Caryville, Dechamps, Dunnbot, Newlang, and Scotah soil series. Udipsamments make up 76% of the acreage of this site. The remaining acreage is mostly Udifluvents and Psammaquents. Endoaquolls make up a very small acreage in Sauk County.

These soils formed in sandy alluvium or outwash derived from sandstone. These soils typically lack bedrock contact. Drainage may be very slow to moderately rapid. Some sites meet hydric soil requirements.

These sites usually have sand to sandy loam surfaces that are sometimes mucky. Organic surfaces are found on some sites, especially along lower stream orders (ie. outer tributaries to the Chippewa, Black, and Wisconsin rivers). The substratum is sandy, sometimes with loamy strata. Subsurface fragments may occupy as much as 20% volume of the substratum. These soils are extremely acid to slightly alkaline. They generally lack secondary carbonates within 39 inches (100 cm) of the surface.

Table 4. Representative soil features

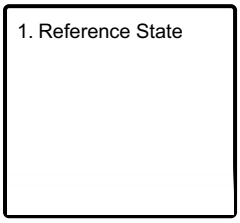
Parent material	(1) Alluvium (2) Outwash (3) Herbaceous organic material
Surface texture	(1) Muck (2) Loamy sand (3) Sandy loam (4) Loam (5) Silt loam
Drainage class	Very poorly drained to well drained
Permeability class	Slow to moderately rapid
Soil depth	201 cm
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0%
Available water capacity (0-150.1cm)	3.61–9.09 cm
Soil reaction (1:1 water) (0-100.1cm)	4.1–7.5
Subsurface fragment volume <=3" (0-100.1cm)	0–20%
Subsurface fragment volume >3" (0-100.1cm)	0–3%

Ecological dynamics

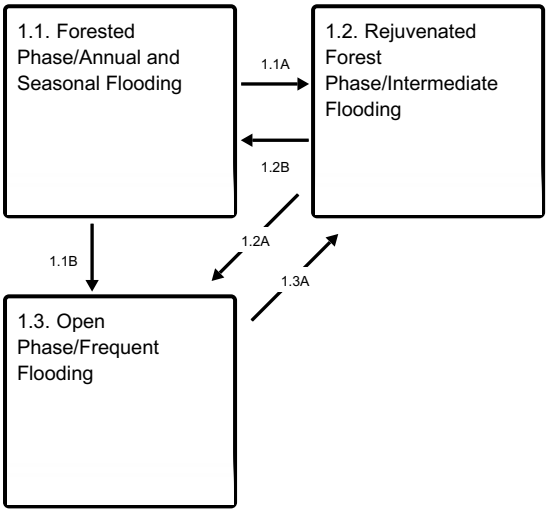
Because this Ecological Site is subject to seasonal, yearly and long-term variation in hydrological conditions, it is difficult to speak of any directional, community-driven plant succession, as is typical of more environmentally-stable upland plant communities. However, this site being on more stable broad floodplains does seem to have some successional character. Even still, individual hydrologic events create conditions temporarily favorable to a given species, or groups of species, and unfavorable to other species or groups. Species differ greatly in their ability to tolerate frequency of flooding and duration of ponding. Frequency and duration of flooding/ponding is the main driver as to which of these community phases will be achieved and maintained. In the case where only annual or seasonal flooding occurs succession is could occur in a manner similar to an upland site.

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1A - Ponding frequency and duration increase.

1.1B - Ponding frequency and duration increase dramatically.

1.2B - Very infrequent ponding.

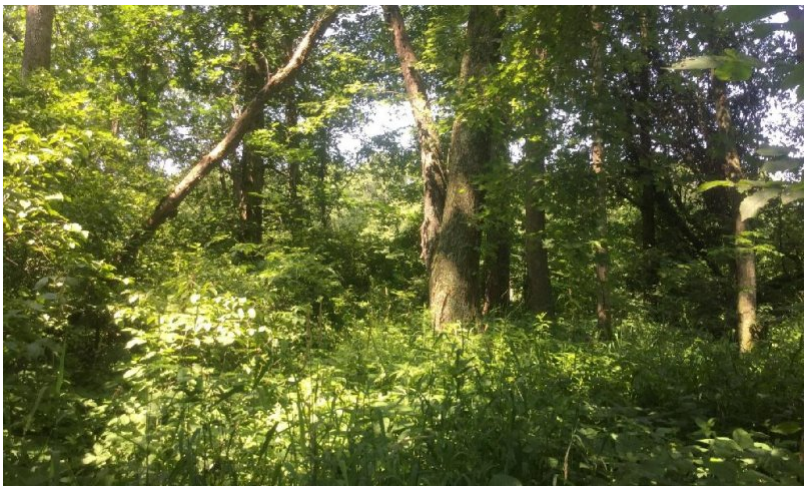
1.2A - Ponding frequency and duration increase moderately.

1.3A - Ponding frequency and duration decrease.

State 1
Reference State

Because of the dynamic nature of hydrological events affecting this Ecological Site, many different plant communities can be found at any given time. Three distinct community phases represent the Reference state: 1) a forested phase with seasonal, brief flooding, community phase, 2) rejuvenated forest phase with intermediate flooding community phase, and 3) open phase frequently flooded community phase.

Community 1.1
Forested Phase/Annual and Seasonal Flooding



This community phase consists of forest communities tolerant of seasonal, brief flooding. Such forests are characterized by strong presence, or dominance of black ash (*Fraxinus nigra*), with various associates (elms, hickories, silver maple, swamp white oak). The shrub layer is not well developed. Characteristic understory plants include sedges, grasses, and Jewelweed (*Impatiens capensis*).

Dominant plant species

- black ash (*Fraxinus nigra*), tree
- elm (*Ulmus*), tree
- silver maple (*Acer saccharinum*), tree
- gray alder (*Alnus incana*), shrub
- dogwood (*Cornus*), shrub
- sedge (*Carex*), grass
- jewelweed (*Impatiens capensis*), other herbaceous

Community 1.2
Rejuvenated Forest Phase/Intermediate Flooding

This community phase is dominated by Silver maple, black willow, and other species tolerant of extended flooding. The understory is dominated by sedges and grasses with a presence of jewelweed.

Dominant plant species

- silver maple (*Acer saccharinum*), shrub
- black willow (*Salix nigra*), shrub
- sedge (*Carex*), grass

Community 1.3
Open Phase/Frequent Flooding

This community is dominated by sedges and grasses with a few very tolerant associates and sporadic willows. These sites often have standing water throughout the growing season.

Dominant plant species

- willow (*Salix*), tree
- sedge (*Carex*), grass

Pathway 1.1A
Community 1.1 to 1.2

Increase in flooding frequency and duration. Mortality of canopy species.

Pathway 1.1B

Community 1.1 to 1.3

Ponding frequency and duration increase dramatically.

Pathway 1.2B
Community 1.2 to 1.1

Decrease in ponding frequency and duration. Establishment of black ash and associates.

Pathway 1.2A
Community 1.2 to 1.3

Ponding frequency and duration increase moderately.

Pathway 1.3A
Community 1.3 to 1.2

Decrease in flooding frequency and duration. Establishment of silver maple and other species tolerant of some extended ponding events.

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 of 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, 2/23/2024

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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	05/18/2024
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:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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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):**

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:**