

Ecological site R035XF600NM

Malpais

Last updated: 5/19/2025
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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.

Ecological site concept

This component is on lava flows, uplands, benches, mesas, and questas. The parent material consists of eolian deposits over alluvium derived from sandstone and shale. Depth to a root restrictive layer, basalt bedrock (lithic), is 10 to 20 inches. Slopes are 0 to 15 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata</i>
Herbaceous	(1) <i>Bouteloua gracilis</i> (2) <i>Bouteloua curtipendula</i>

Physiographic features

This component is on lava flows, uplands, benches, mesas, and questas. The parent material consists of eolian deposits over alluvium derived from sandstone and shale. Depth to a root restrictive layer, basalt bedrock (lithic), is 10 to 20 inches. Slopes are 0 to 15 percent and elevations range from about 5,600 to 7,500 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Mesa (2) Terrace (3) Lava plateau
Flooding frequency	None

Ponding frequency	None
Elevation	1,707–2,286 m
Slope	0–15%
Aspect	Aspect is not a significant factor

Climatic features

Average annual precipitation varies from about 13 inches to just over 16 inches. Substantial fluctuations from year to year are common, ranging from a low of about 6 inches to a high of over 30 inches. Approximately one-half of the annual precipitation comes in the form of rainfall during the months of July, August, and September, although wintertime precipitation in the form of snow, sleet, or rain is sometimes significant. Spring and late fall months are normally dry.

The average frost-free period ranges from about 165 to 190 days and extends from approximately the third or fourth week in April to mid October. Average annual air temperatures are about 56 degrees F. Summer maximums can exceed 100 degrees F and winter minimums on occasion go below zero. Monthly mean temperatures generally exceed 70 degrees F for the period of June through August.

Growing conditions favor warm-season vegetation, although late winter and late summer precipitation is adequate to foster a significant cool-season component in the potential plant community. Occasional wet springs also create good conditions for annual forb production, but frequent winds from the west and southwest are common during this time of year and tend to deplete soil moisture at a critical time for the growth of these plants.

Climate data was obtained from <http://www.wrcc.sage.dri.edu/summary/climsmnm.html> web site using 50% probability for freeze-free and frost-free seasons using 28.5 degrees F and 32.5 degrees F respectively.

Table 3. Representative climatic features

Frost-free period (average)	142 days
Freeze-free period (average)	146 days
Precipitation total (average)	305 mm

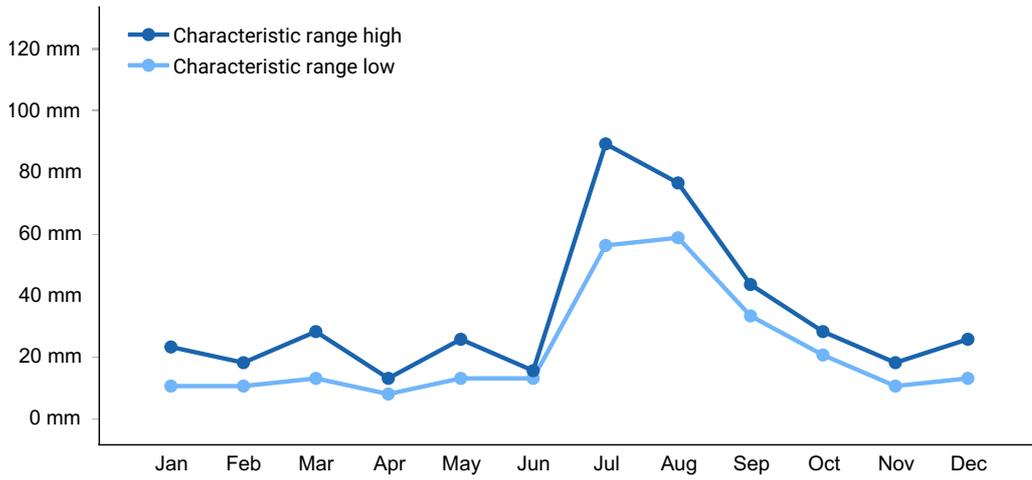


Figure 1. Monthly precipitation range

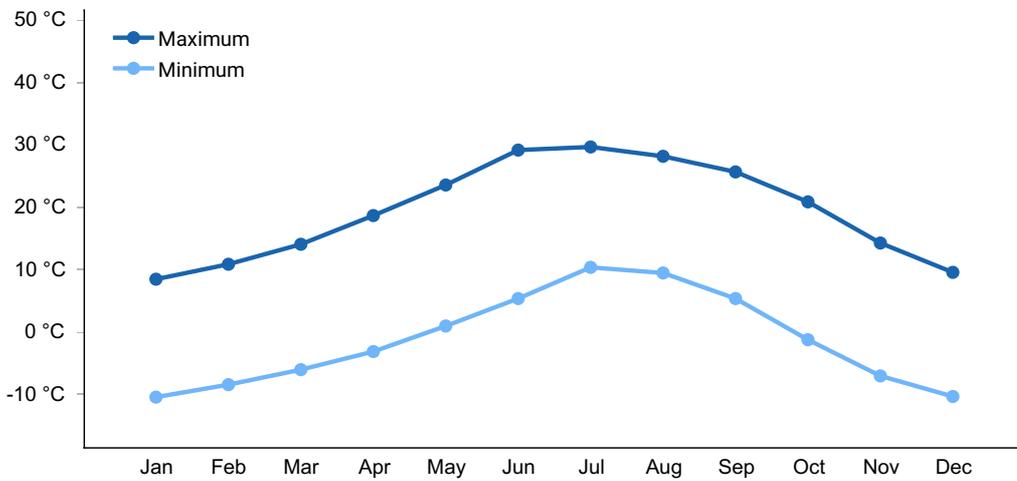


Figure 2. Monthly average minimum and maximum temperature

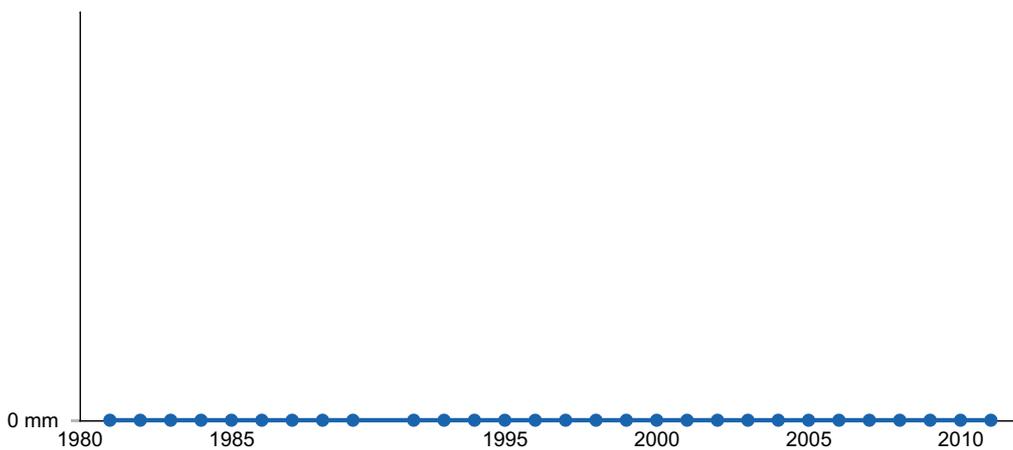


Figure 3. Annual precipitation pattern

Influencing water features

This site is not influenced by water from a wetland or stream.

Soil features

Slopes are 1 to 5 percent. This site is on lava flows, uplands, basalt uplands, mesas, and questas. The parent material consists of eolian deposits over alluvium derived from sandstone and shale. Depth to a root restrictive layer, basalt bedrock (lithic), is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches typically does not exceed 8 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

SSA-692 McKinley County Area NM - 575 Pescado

Table 4. Representative soil features

Surface texture	(1) Stony fine sandy loam (2) Cobbly loam (3) Gravelly clay loam
Family particle size	(1) Loamy
Drainage class	Well drained to moderately well drained
Permeability class	Slow to moderate
Soil depth	25–51 cm
Surface fragment cover ≤3"	0–5%
Surface fragment cover >3"	10–20%
Available water capacity (0-101.6cm)	6.35–12.7 cm
Calcium carbonate equivalent (0-101.6cm)	1–10%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	6.6–7.8
Subsurface fragment volume ≤3" (Depth not specified)	10–15%
Subsurface fragment volume >3" (Depth not specified)	35–45%

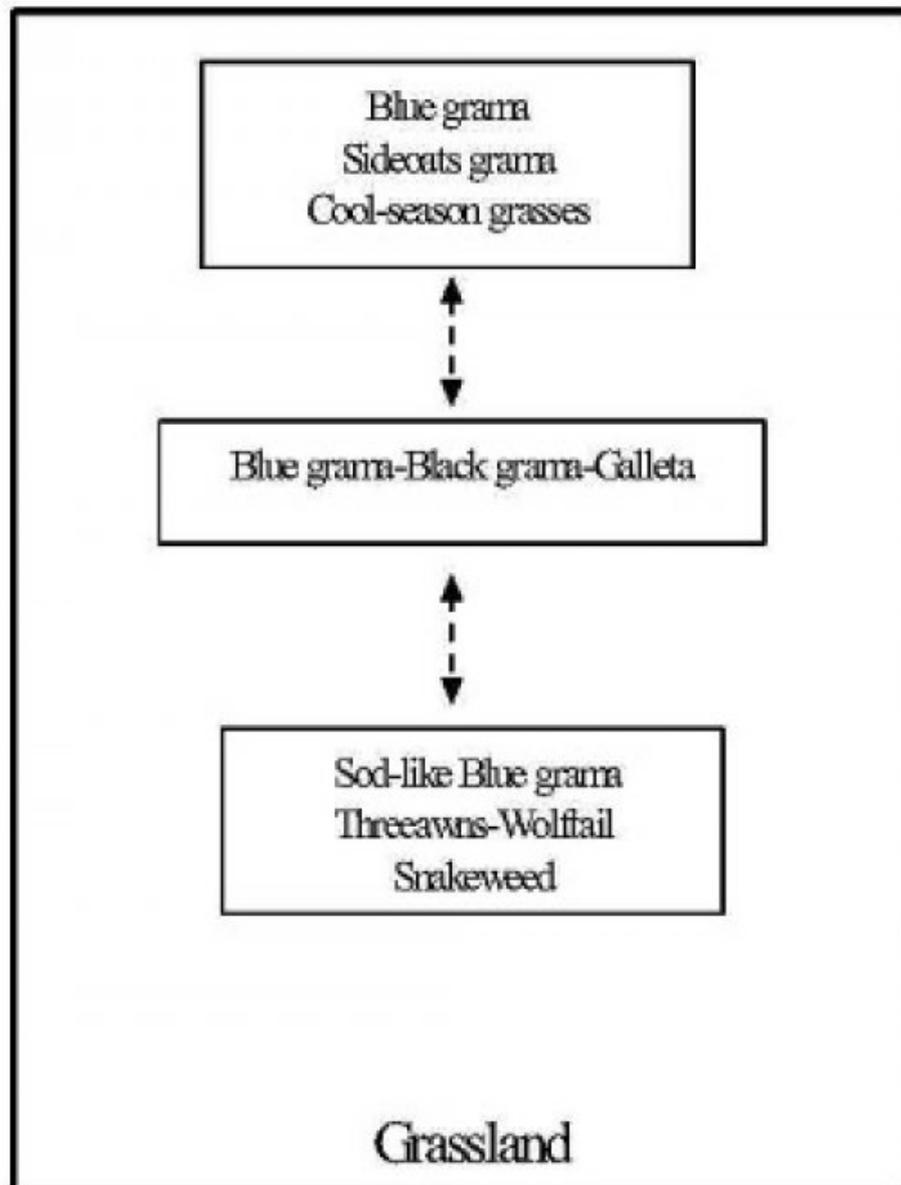
Ecological dynamics

Overview

The Malpais site occurs on basalt-capped mesa tops, low hills and ridges, and on old lava flows. The soils are shallow over basalt and often cobbly or stony. This site is often associated with Loamy sites. The Loamy site can occur as low valleys dissecting the hills, ridges and old lava flows, or Loamy sites may occur with Malpais sites, as pockets of deeper soils on mesa tops. This is predominantly a grassland site characterized by a mixture of warm- and cool-season grasses, scattered shrubs, and a few trees. Blue grama and sideoats grama are the dominant grasses. Woody species may include winterfat, fourwing saltbush, piñon, and juniper. This site appears to be highly resistant to state change, as no alternate states were identified during our inventory. This resistance may be due in part to the high volume of rock fragments that occur on the soil surface, strong argillic horizons, and a shallow depth to bedrock. The cobbles and stones on the soil surface may help to protect the site from accelerated erosion and limit grazing accessibility by protecting grass bases. Argillic horizons and basalt bedrock can help to keep water perched and available, favoring shallow-rooted grasses.

State and transition model

MLRA 36, WP-2 & 3 Malpais



State 1 Reference State

As of now, this is the only state identified. It is dominated by grasses.

Community 1.1 Historic Climax Plant Community

Grassland: Grasses are the dominant component of the historic plant community accounting for 75 to 85 percent of the total production. Blue grama and sideoats grama are the dominant grasses. Also characteristic are such species as western wheatgrass, little bluestem, spike muhly, alkali sacaton, black grama, galleta, and New Mexico feathergrass. Winterfat, fourwing saltbush, and broom snakeweed are common shrubs. A few piñon and juniper may be found widely scattered across the site. Changes in composition to the historic plant community may occur due to continuous heavy grazing. Typically, there is a decrease in cool season grasses, sideoats grama, little bluestem, and spike muhly. Communities dominated by blue grama, galleta, and black grama may result. Any of the three species may assume dominance depending on individual site characteristics. Blue grama seems to be the most grazing resistant species and under continued heavy use, a sod-like blue grama dominated community may result. Other species that are typically found in this community include threeawns, wolftail and snakeweed. Diagnosis: Grass composition is variable and cover ranges from uniform to patchy, with numerous small, spatially separated, bare patches. Shrubs and a few trees may be present on the site with a combined canopy cover averaging seven percent. Evidence of erosion such as pedestalling of grasses, rills, and gullies is limited.

Dominant plant species

- blue grama (*Bouteloua gracilis*), grass
- sideoats grama (*Bouteloua curtipendula*), grass

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	381	684	986
Forb	48	86	123
Shrub/Vine	28	56	67
Tree	22	34	56
Total	479	860	1232

Table 6. Soil surface cover

Tree basal cover	5-10%
Shrub/vine/liana basal cover	5-10%
Grass/grasslike basal cover	20-25%
Forb basal cover	5-10%
Non-vascular plants	0%
Biological crusts	0%
Litter	5-10%

Surface fragments >0.25" and <=3"	15-35%
Surface fragments >3"	15-35%
Bedrock	0%
Water	0%
Bare ground	8%

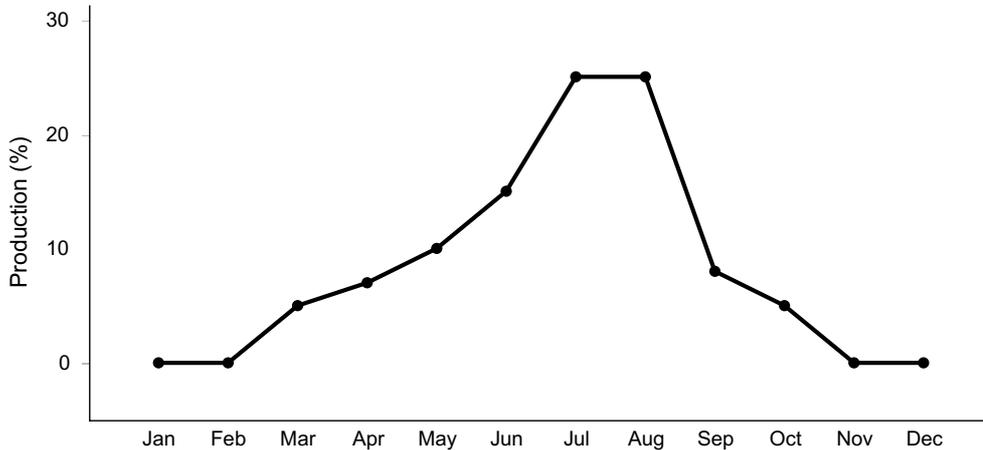


Figure 6. Plant community growth curve (percent production by month). NM0301, R035XA109NM-Malpais-HCPC. Mixed warm/cool-season perennial grassland w/shrub and half-shrub component..

Community 1.2

Blue grama, black grama, galleta community

This community is dominated by blue grama, black grama, and galleta.

Dominant plant species

- blue grama (*Bouteloua gracilis*), grass
- black grama (*Bouteloua eriopoda*), grass
- James' galleta (*Pleuraphis jamesii*), grass

Community 1.3

Sod-bound blue grama, shrubby

This community is dominated by sod-bound blue grama. Other well-represented grasses are threeawns, and wolfstail. Broom snakeweed is also relatively abundant.

Dominant plant species

- broom snakeweed (*Gutierrezia sarothrae*), shrub
- blue grama (*Bouteloua gracilis*), grass
- threeawn (*Aristida*), grass
- wolfstail (*Lycurus*), grass

Pathway P1.1A Community 1.1 to 1.2

Continuous grazing.

Pathway P1.2A Community 1.2 to 1.1

Prescribed/deferred grazing

Pathway P1.2B Community 1.2 to 1.3

Prolonged continuous grazing.

Pathway P1.3A Community 1.3 to 1.2

Prescribed/deferred grazing.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				171–214	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	171–214	–
2				85–128	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	85–128	–
3				85–128	
	spike muhly	MUWR	<i>Muhlenbergia wrightii</i>	85–128	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	85–128	–
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	85–128	–
4				9–43	
	black grama	BOER4	<i>Bouteloua eriopoda</i>	95–43	–
5				43–128	
	needle and	HECO26	<i>Hesperostipa comata</i>	43–128	–

	thread				
6				9-43	
	cane bluestem	BOBA3	<i>Bothriochloa barbinodis</i>	9-43	-
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	9-43	-
7				9-43	
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	9-43	-
	tobosagrass	PLMU3	<i>Pleuraphis mutica</i>	9-43	-
8				26-43	
	curly- mesquite	HIBE	<i>Hilaria belangeri</i>	26-43	-
	dropseed	SPORO	<i>Sporobolus</i>	26-43	-
9				9-26	
	threeawn	ARIST	<i>Aristida</i>	9-26	-
10				9-26	
	squirreltail	ELEL5	<i>Elymus elymoides</i>	9-26	-
11				9-26	
	common wolfstail	LYPH	<i>Lycurus phleoides</i>	9-26	-
Forb					
12				9-43	
	annual buckwheat	ERAN4	<i>Eriogonum annuum</i>	9-43	-
	bastardsage	ERWR	<i>Eriogonum wrightii</i>	9-43	-
13				9-43	
	Forb, annual	2FA	<i>Forb, annual</i>	9-43	-
14				9-26	
	Forb, perennial	2FP	<i>Forb, perennial</i>	9-26	-
Tree					
15				9-26	
	oak	QUERC	<i>Quercus</i>	95-26	-
16				9-52	
	juniper	JUNIP	<i>Juniperus</i>	9-52	-
	twoneedle	PIED	<i>Pinus edulis</i>	9-52	-

	pinyon				
Shrub/Vine					
17				9-26	
	rubber rabbitbrush	ERNAN5	<i>Ericameria nauseosa ssp. nauseosa var. nauseosa</i>	9-26	-
	Apache plume	FAPA	<i>Fallugia paradoxa</i>	9-26	-
	rubber rabbitbrush	ERNAN5	<i>Ericameria nauseosa ssp. nauseosa var. nauseosa</i>	9-26	-
	Apache plume	FAPA	<i>Fallugia paradoxa</i>	9-26	-
18				26-68	
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	26-68	-
19				9-26	
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	9-26	-
20				0-9	
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-9	-

Animal community

Habitat for Wildlife:

This site provides habitat which can support a resident animal community characterized by mule deer, rock squirrel, brush mouse, Stephen's woodrat, gray fox, bobcat, scaled quail, ladderbacked woodpecker, scrub jay, common bushtit, rock wren, brown towhee, rufous-crowned sparrow, chipping sparrow, ash-throated flycatcher, short-horned lizard, collared lizard, Eastern fence lizard, tree lizard, red-spotted toad, and black-tailed rattlesnake.

Hydrological functions

The runoff curve numbers are determined by field investigations using hydrologic cover conditions and hydrologic soil groups.

Hydrologic Interpretations

Soil Series-----Hydrologic Group

Pescado-----D

Recreational uses

This site offers recreation potential for hiking, picnicking, camping, nature observation and photography, bird watching, and hunting for mule deer, mourning dove, and quail. When favorable growing-season moisture conditions occur, a colorful display of wildflowers may be seen.

Wood products

This site has little or no significant value for wood products.

Other products

Grazing:

This site is suitable for grazing in all seasons of the year. It is best adapted for cattle and horses, but can also be utilized by sheep and goats. Continuous yearlong grazing may, however, result in a decline or disappearance of cool-season grasses and preferred browse plants. If grazing use

is heavy or prolonged, such plants as sideoats grama, little bluestem, spike muhly, and black grama will also decrease. Ordinarily, as retrogression continues, blue grama, tobosa or galleta, curly mesquite, threeawns, and broom snakeweed begin to dominate.

Eventually, even blue grama may decline. The site is not highly erodible, and reasonably rapid recovery can be effected by good grazing management.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index-----	Ac/AUM
100 - 76-----	3.0 – 4.2
75 – 51-----	4.0 – 6.5
50 – 26-----	6.0 – 10.0
25 – 0-----	10.0+

Type locality

Location 1: Catron County, NM
Location 2: McKinley County, NM
Location 3: Sandoval County, NM

Other references

Data collection for this site was done in conjunction with the progressive soil surveys within the New Mexico and Arizona Plateaus and Mesas 36 Major Land Resource Area of New Mexico. This site has been mapped and correlated with soils in the following soil

surveys: McKinley, Cibola, Sandoval.

Characteristic Soils Are:

Pescado

Contributors

Peter Lefebvre

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	03/13/2026
Approved by	Kendra Moseley
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:**
