USDA Natural Resources Conservation Service

Ecological site R070CY112NM
Sandy

Last updated: 10/21/2024
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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.

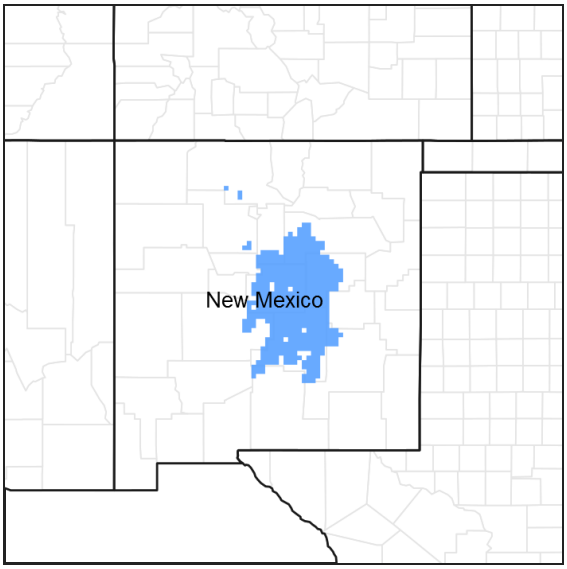

Figure 1. Mapped extent

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): 042C–Central New Mexico Highlands

Major Land Resource Area (MLRA): 070C–Central New Mexico Highlands

Major Land Resource Area (MLRA) 70C - will become 42C - is a high elevation portion of central New Mexico that is the convergence of four major physiographic provinces: Basin and Range, Southern Rocky Mountains, Great Plains, and Colorado Plateau. As such, it contains parts or characteristics of each, though tectonically, as a region, it is the easternmost extent of the Basin and Range Province and, more specifically, a structural expression of the Rio Grande Rift. It consists mostly of rangeland with some forested areas associated with numerous disconnected mountain ranges such as the Guadalupe, Sacramento, and Manzano Mountains. Other major physiographic features include the Galisteo Basin or the enclosed Estancia Basin, the structural Chupadera and Glorieta Mesas, and the piedmonts of the Buchanan and Guadalupe Mesas.

LRU notes

At this point this site is not assigned to an established LRU.

Ecological site concept

This site occurs on soils with low relief (1 to 10 percent slopes) where the textures of the fine earth fraction are coarser, especially at the surface. The combining theme is that these landforms are proximal to eolian processes that either created the sites or will cause them to severely deteriorate if degraded. A sandy-textured topsoil that is intact will allow precipitation to be effectively incorporated into the soil, and where this overlies less sandy textures they will potentially favor grass species and other shallow rooted plants as well as higher amounts of organic matter accumulation. These areas should be far more productive than areas that have degraded, blown-out, or are composed of un-stratified deep sands.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex canescens* (2) *Ephedra*
Herbaceous	(1) *Andropogon hallii* (2) *Bothriochloa barbinodis*

Physiographic features

This site occurs on level to gently sloping or undulating piedmont slopes or plains. Slopes average less than 10 percent but will range as high as 15 percent. Aspect varies but is not significant. Elevation ranges from 5,000 to 7,000 feet above sea level.

Chupadera soils formed on crests and sideslopes of rolling hills and on structural benches within undulating plateaus. These soils formed in eolian sands and material weathered from limestone, sandstone, and shale with elevations ranging from 6,000 to 6,700 feet and slopes ranging from 1 to 15 percent.
Ignacio soils are on sandsheets on mesas, hills, and ridges. The slopes range from 1 to 15 percent. The soils formed in eolian material weathered from sandstone. Elevation ranges from 4,626 to 7,000 feet.
These soils formed mostly on mesas, eroded fan remnants, escarpments, fan terraces, and hills. The soils formed from alluvium, colluvium and eolian materials derived from quartzite, monzonite, granite, basalt, gneiss, schist and limestone. Elevation ranges from 5,000 to 7,000 feet. Slope ranges from 0 to 75 percent.
Otero - Landscape: hills, and alluvial plains; Landform: fans, blowouts, terraces, hills, ridges, and plains (Surfaces are frequently wind-reworked and have a low dune-like relief); Slopes: 0 to 20 percent; Parent material: alluvial sediments that have been wind-modified in many places
Palma soils formed in alluvial and eolian material on hillslopes, plateaus, undulating plains, dunes of plains, fan terraces and fan piedmonts. Slope ranges from 0 to 15 percent. Elevation ranges from 4,500 to 7,600 feet
Penistaja soils are on mesas, plateaus, hills, cuestas and bajadas. Slopes are 0 to 10 percent. They formed in alluvium, fan alluvium, slope alluvium and eolian material derived principally from sandstone and shale. Elevations range from 4,800 to 7,100 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan piedmont (2) Plain
Elevation	1,524–2,134 m
Slope	10–15%
Aspect	Aspect is not a significant factor

Climatic features

The climate of the area is “semi-arid continental.”

The average annual precipitation ranges from 13 to 16 inches. Variations of 5 inches, more or less, are not uncommon. Seventy-five percent of the precipitation falls from April to October. Most of the summer precipitation comes in the form of high intensity-short duration thunderstorms.

Distinct seasonal changes and large annual and diurnal temperature changes characterize temperatures. The

average annual temperature is about 50 degrees F with extremes of -29 degrees F in the winter and 103 degrees F in the summer.

The average frost-free season 130 to 160 days. The last killing frost falling in early May and the first killing frost in early October.

Both temperature and precipitation favor warm-season perennial plant communities. However, about 40 percent of the annual precipitation falls at a time favorable for cool-season species. Because of the soils on this site, the vegetation can respond quickly to a light rain. Strong winds blow across this area from February to June from the west and southwest. These winds can dry the soil profile quickly at a time critical for cool-season plant growth. These winds also carry soil particles that can severely damage the plants on this site.

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.

Chupadera - Average annual precipitation ranges from 12 to 15 inches. Average annual air temperature is 47 to 51 degrees. Frost free period is 120 to 160 days.
Ignacio - The mean annual air temperature is 48 to 56 degrees F. and the mean summer air temperature is 68 degrees F. Average annual precipitation ranges from 9 to 13 inches.
Ildefonso - The average mean annual temperature is 48 to 55 degrees F. The mean annual precipitation is 9 to 13 inches. Frost-free period is 120 to 175 days.
Otero - Mean annual precipitation: 33 to 43 centimeters (13 to 17 inches), with peak periods of precipitation during April through August; Mean annual air temperature: 9 to 12 degrees C. (48 to 54 degrees F.); Mean summer temperature: 20 to 23 degrees C. (68 to 74 degrees F.); Frost free period: 120 to 165 days.
Palma - Mean annual temperature ranges from 49 to 55 degrees F. and mean annual precipitation ranges from 10 to 14 inches, but is as high as 15 inches in areas. The majority of the precipitation falls during the late summer. The frost-free period ranges from 125 to 170 days
Penistaja - The mean annual precipitation is 10 to 14 inches. Mean annual air temperature is 49 to 57 degrees F. The frost-free period is 115 to 180 days.

Table 3. Representative climatic features

Frost-free period (average)	173 days
Freeze-free period (average)	187 days
Precipitation total (average)	406 mm

Influencing water features

This is an upland site, and is not associated with water features or wetlands. During heavy rain events, this site may receive run-on and/or throughflow moisture from landforms above and contribute throughflow to landforms below.

Soil features

The soils of this site are well drained, moderately deep to deep. Typically, the surface textures are fine sandy loams to loamy sands 5 inches or more over sandy clay loam, clay loam, or very fine sandy loam. Permeability is moderately slow to rapid with a moderate to high water-holding capacity. Due to the coarse-textured surfaces, these soils are subject to blowing when the surface is not protected by plant cover.

The following soil series are used in components correlated to this site, with an emphasis on the Penistaja series as the more common example:
Chupadera COARSE-LOAMY, MIXED, SUPERACTIVE, MESIC USTIC HAPLOCALCIDS
Ignacio COARSE-LOAMY, MIXED, SUPERACTIVE, MESIC USTIC HAPLOCAMBIDS
Ildefonso LOAMY-SKELETAL, MIXED, SUPERACTIVE, MESIC USTIC HAPLOCALCIDS
Otero COARSE-LOAMY, MIXED, SUPERACTIVE, CALCAREOUS, MESIC ARIDIC USTORTHENTS
Palma COARSE-LOAMY, MIXED, SUPERACTIVE, MESIC USTIC CALCIARGIDS
Penistaja FINE-LOAMY, MIXED, SUPERACTIVE, MESIC USTIC HAPLARGIDS

The Chupadera series consists of moderately deep, well drained soils that formed in eolian sands and residuum from limestone on rolling bedrock controlled uplands and on structural benches of plateaus. Slopes range from 1 to 15 percent. Well drained; very low to low surface runoff; moderately rapid permeability.
The Ignacio series consists of moderately deep, well drained, moderately rapidly permeable soils that formed in eolian material weathered from sandstone. These soils are on sandsheets on mesas, hills, and ridges and have slopes ranging from 1 to 15 percent. Well drained. Runoff is medium. Permeability is moderate or moderately rapid.
The Ildefonso series consists of very deep, well drained, moderately rapidly permeable soils that formed in alluvium, colluvium and eolian sediments derived from quartzite, monzonite, granite, basalt, gneiss, schist and limestone. Ildefonso soils are on mesas, fan terraces, eroded fan remnants, escarpments, and hills. Slopes are 0 to 75 percent. Well drained. Permeability is moderately rapid. Runoff is negligible on slopes less than 1 percent, very low on 1 to 5 percent slopes, low on 5 to 20 percent slopes, and medium on slopes greater than 20 percent.
The Otero series consists of very deep, well or somewhat excessively drained soils that formed in alluvium and eolian material. Otero soils are on hills, plains, blowouts, ridges, stream terraces, and fans. Slopes are 0 to 20 percent. Drainage well or somewhat excessively drained Runoff: low to medium Saturated hydraulic conductivity: high
The Palma series consists of very deep, well and somewhat excessively drained, moderately rapidly permeable soils that formed in alluvium and eolian soil material derived from sandstone and shale. These soils are on hillslopes, plateaus,undulating plains, dunes of plains, fan terraces and fan piedmonts. Slope ranges from 0 to 15 percent. Somewhat excessively drained. Permeability is moderately rapid. Runoff is negligible on slopes less than 3 percent, very low on 3 to 5 percent slopes, low on 5 to 10 percent slopes, and medium on 10 to 15 percent slopes.
The Penistaja series consists of very deep, well drained, moderately permeable soil that formed in mixed alluvium, fan alluvium, slope alluvium and eolian material derived from sandstone and shale. Penistaja soils are on mesas, plateaus, hills, cuestas and bajadas. Slopes are 0 to 10 percent. Well drained; low runoff; moderate permeability.

Table 4. Representative soil features

Surface texture	(1) Fine sandy loam (2) Sandy loam (3) Loamy fine sand
Family particle size	(1) Loamy
Soil depth	13–183 cm
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–4
Soil reaction (1:1 water) (0-101.6cm)	6.6–9

Ecological dynamics

This site responds rapidly to any rainfall it might receive. It also responds well to a system of grazing which rotates the season of use.

Legacy Ecological Dynamics Narrative:
"Chupadera soils are used for livestock grazing and wildlife habitat. Present vegetation is blue grama, oneseed juniper, narrowleaf yucca, broom snakeweed, walkingstick cholla, whipple cholla, plains prickly pear, sand dropseed, and threeawn.
Most areas of Ignacio soils are used for range. Vegetation is sideoats grama, blue grama and sand dropseed.
Ildefonso soils are used as rangeland. The vegetation is dominantly blue grama and muhly together with black grama, hairy grama, sideoats grama, juniper, and sacahuista.
Otero soils are used for native rangeland or for dry and irrigated cropland. Native vegetation consists of tall and short grass associations with some yuccas and sand sage.
Palma is used mostly for livestock grazing. Vegetation is blue grama, sand dropseed, sandsage, yucca, and cactus.
Penistaja soils are used for livestock grazing. Vegetation is blue grama, western wheatgrass, Indian ricegrass, galleta, winterfat and fourwing saltbush."

State and transition model

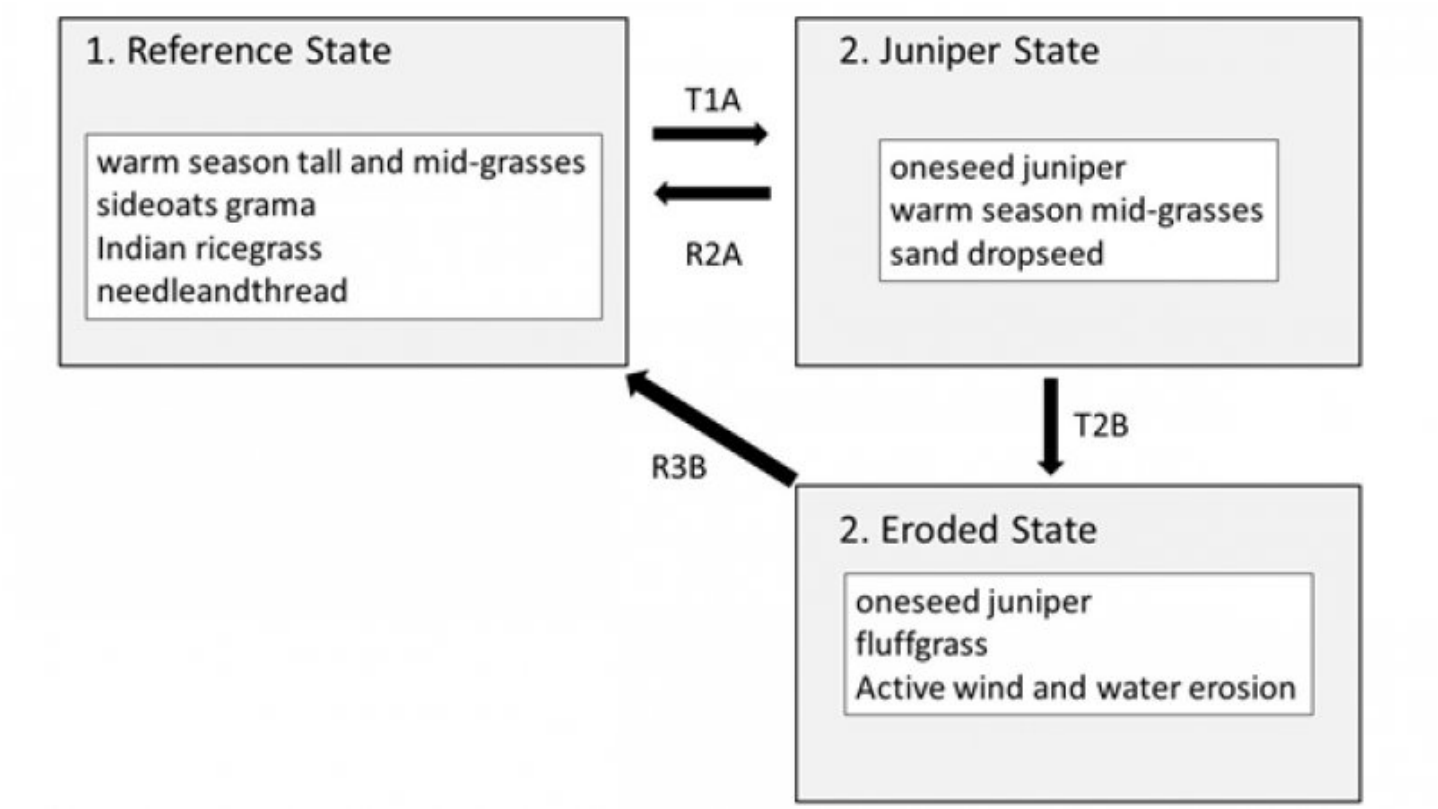

Figure 4. Generalized STM for sandy sites in 70C

State 1
Reference State

This state contains blue grama, western wheatgrass, Indian ricegrass, winterfat and fourwing saltbush.

Resilience management. This site responds well to a system of grazing which rotates the season of use.

Community 1.1
Reference Plant Community

Perennial grasses characterize this phase. There is a scattering of shrubs, half-shrubs, and forbs. Woody species occupy a minor part of this plant community. Forbs are also a minor component of this site. However, during years of abundant rainfall, forb production can become quite significant, with a large variety of forbs scattered throughout the site. This site has a high potential for soil blowing if the natural vegetative cover is not maintained. Other grasses that could appear on this phase include: little bluestem, hairy grama, mesa dropseed, threeawn, green sprangletop, Metcalf muhly, curlyleaf muhly, red muhly, prairie sandreed, alkali sacaton, bottlebrush squirreltail, sandhill muhly, mat muhly, ring muhly, plains lovegrass, purple lovegrass, and bush muhly. Other shrubs include: rabbitbrush, broom snakeweed, pinyon, juniper, mountainmahogany, algerita, Apacheplume, Bigelow sagebrush, and cacti spp. Other forbs include: larkspur, purple nightshade, salsify, lupine, curly dock, Indian paintbrush, scarlet globemallow, Rocky Mountain beeplant, threadleaf groundsel, wooly Indian-wheat, tansymustard, and Russian thistle.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	213	740	1255
Forb	34	123	213
Total	**247**	**863**	**1468**

Table 6. Ground cover

Tree foliar cover	2-3%
Shrub/vine/liana foliar cover	3-6%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	8-10%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	60-70%

Figure 6. Plant community growth curve (percent production by month). NM4312, R070CY112NM Sandy Reference State. R070CY112NM Sandy Reference State Mixed warm/cool-season perennial grassland with scattered shrubs, half-shrubs and forbs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	7	10	15	25	25	8	5	0	0

State 2
Juniper

This state is definitely not suited to continuous yearlong grazing or continuous grazing during the growing season. As deterioration continues, this sod-like blue grama will decrease and an increase of bare grounds and woody vegetation will occur. If this occurs, the site may support a good even-aged stand of pinyon and/or juniper. This site is extremely erosive when in a deteriorated state.

Characteristics and indicators. Increased bare ground and woody vegetation with an even-aged stand of pinyon and/or juniper. This site is extremely erosive when in a deteriorated state.

Resilience management. Deferred and rotational grazing.

State 3
Eroded

High incidence of bare ground and blow-outs. This site is highly susceptible to wind erosion when in a deteriorated state.

Resilience management. Keep vegetated at all cost.

Transition T1A
State 1 to 2

Season-long grazing providing little rest and recovery for preferred grazed plants during critical growing periods, coupled with high utilization.

Restoration pathway R2A
State 2 to 1

Legacy Statement: "Restoration pathway resulting from the implementation of prescribed grazing." It should be

noted that prescribed grazing alone may not markedly reduce juniper cover. Rather, prescribed grazing is likely an essential component of a restoration pathway--which likely includes brush control as well.

Conservation practices

Grazing Management Plan - Applied

Transition T2A
State 2 to 3

Season-long grazing providing little rest and recovery for preferred grazed plants during critical growing periods, coupled with high utilization. This leads to pronounced erosion.

Restoration pathway R3A
State 3 to 1

In theory, a very high-energy input--including the addition of topsoil and seeding--could lead to the re-establishment of the reference community.

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				101–191	
	sand bluestem	ANHA	*Andropogon hallii*	99–196	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	99–196	–
2				146–191	
	big bluestem	ANGE	*Andropogon gerardii*	147–196	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	147–196	–
	Indiangrass	SONU2	*Sorghastrum nutans*	147–196	–
3				146–191	
	black grama	BOER4	*Bouteloua eriopoda*	147–196	–
4				101–146	
	needle and thread	HECO26	*Hesperostipa comata*	99–147	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	99–147	–
5				101–146	
	blue grama	BOGR2	*Bouteloua gracilis*	99–147	–
	James' galleta	PLJA	*Pleuraphis jamesii*	99–147	–
6				45–101	
	western wheatgrass	PASM	*Pascopyrum smithii*	49–99	–
7				45–101	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	49–99	–
8				101–146	
	spike dropseed	SPCO4	*Sporobolus contractus*	99–147	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	99–147	–
9				45–101	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	49–99	–
Forb					

Forb					
10				22–34	
	buckwheat	ERIOG	*Eriogonum*	20–29	–
11				22–34	
	leatherweed	CRPOP	*Croton pottsii var. pottsii*	20–29	–
12				22–34	
	locoweed	OXYTR	*Oxytropis*	20–29	–
13				22–34	
	purple sand verbena	ABAN	*Abronia angustifolia*	20–29	–
14				22–34	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	20–29	–
Shrub/Vine					
15				22–45	
	fourwing saltbush	ATCA2	*Atriplex canescens*	20–49	–
	jointfir	EPHED	*Ephedra*	20–49	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	20–49	–
16				45–67	
	oak	QUERC	*Quercus*	49–68	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	49–68	–
	skunkbush sumac	RHTR	*Rhus trilobata*	49–68	–
17				45–67	
	sand sagebrush	ARFI2	*Artemisia filifolia*	49–68	–
	yucca	YUCCA	*Yucca*	49–68	–
18				22–45	
	Shrub, deciduous	2SD	*Shrub, deciduous*	20–49	–

Type locality

Location 1: Guadalupe County, NM
Location 2: Lincoln County, NM
Location 3: San Miguel County, NM
Location 4: Santa Fe County, NM
Location 5: Torrance County, NM
Location 6: Chaves County, NM
Location 7: De Baca County, NM

Other references

Data collection for this site was done in conjunction with the progressive soil surveys within the Pecos-Canadian Plains and Valleys 70 Major Land Resource Area of New Mexico. This site has been mapped and correlated with soils in the following soil surveys: Chaves, De Baca, Guadalupe, Lincoln, Sna Miguel, Santa Fe, Torrance.

Characteristic Soils Are:
Chupadero, Darvey, Dunes, Harvey Hightower Variant, Ignacio, Ildefonso, Laport Otero, Palma, Pedrick, Penistaja, Ribera

Contributors

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Approval

Kendra Moseley, 10/21/2024

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	11/24/2024
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:**