

## Ecological site R070AY018NM Sandstone Savanna

Last updated: 9/12/2023  
Accessed: 02/26/2024

### 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.

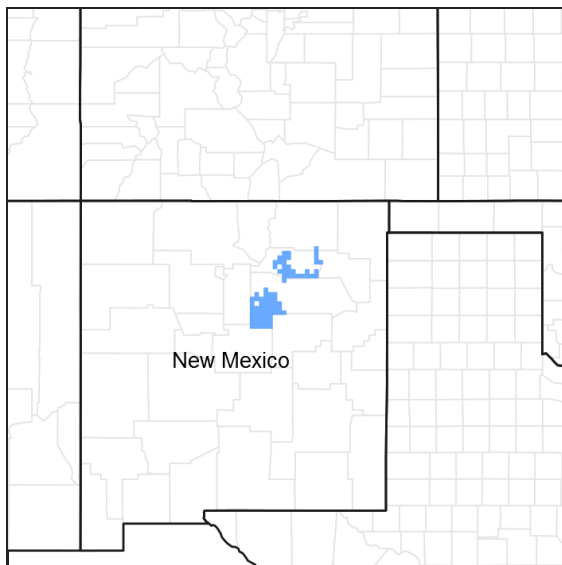


Figure 1. Mapped extent

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.

### Ecological site concept

This site occurs on soils that are shallow to sandstone bedrock. Slopes range from 0 to 25 percent. Soils contain considerable fragments, but are not skeletal.

This site correlates to the Shallow ecological site group.

Table 1. Dominant plant species

Tree	(1) <i>Juniperus</i> (2) <i>Pinus edulis</i>
Shrub	(1) <i>Krascheninnikovia lanata</i> (2) <i>Yucca glauca</i>
Herbaceous	(1) <i>Bouteloua gracilis</i> (2) <i>Bouteloua curtipendula</i>

### Physiographic features

This site is on mesa tops and upland ridge crests, and have slopes of 0 to 25 percent. May also range from 0 (flat rock areas) to 25 percent with inclusions of short steeper slopes. Elevation ranges from 5,500 to 7,500 feet above sea level. The landscape is typically a complex of small pockets of soil and sandstone outcrop in the form of

ledges.

**Table 2. Representative physiographic features**

Landforms	(1) Hill (2) Mesa (3) Cuesta
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	5,300–7,500 ft
Slope	5–25%
Aspect	Aspect is not a significant factor

### **Climatic features**

The climate of this area can be classified as “semi-arid continental”.

Precipitation averages 14 to 16 inches. Seventy seven percent of the year’s moisture normally falls during the period of May through October. Practically all of it is brought by brief afternoon and evening thunderstorms. In July and August, normally the wettest months of the year, one can expect about one day in five when rainfall exceeds one-tenth inch. Early spring precipitation in May benefits the cool-season plants. Winter precipitation, supplying 24 percent of the year’s moisture, normally has no more than two days a month with as much as one-tenth inch of moisture. Much of the winter precipitation falls as snow.

Air temperatures vary from a monthly mean of 20 degrees F in January to 69 degrees F in July. Daily high temperatures average in the 80’s and low 90’s during the summer. Winter low temperatures fall below the freezing mark much of the time from November through March with minimum temperatures approaching 25 degrees F below zero. Dates of the last killing frost may vary from May 9th through May 17th, and the first killing frost from September 27th to October 8th. The frost-free season ranges from 141 days to 153 days from early May to early October.

Wind velocities for the area average 10 to 12 miles per hour and prevail from the south and southwest. Generally, March is the windiest month. Strong winds during the spring cause rapid drying of the soil surface.

Nearby mountains to the west intercept much of the precipitation from the Pacific storms coming through this area during the winter. About 70 percent of the 14 to 16 inches of annual precipitation falls in the form of rainfall during the frost-free season. About 40 percent of the annual precipitation benefits cool-season plants, 50 percent benefits warm-season plants and 10 percent falls during the season of plant dormancy. Relative humidity is moderately low. The sun shines approximately 75 percent of the time.

Climate data was obtained from <http://www.wrcc.sage.dri.edu/summary/climsmnm.html> web site using 50 percent 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)	149 days
Freeze-free period (average)	171 days
Precipitation total (average)	16 in

### **Influencing water features**

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

## Soil features

Soils are very shallow to shallow over sandstone bedrock. Surface textures are clay loam, loam, fine sandy loam, loamy sand, fine sandy loam, silt loam or the channery, flaggy, or stony types of these textures. Subsurface texture are flaggy or stony loam, sandy loam, to sandy clay loam. Thickness of the solum and depth to sandstone bedrock range from 8 to 20 inches. Permeability is moderate. Available water holding capacity is low. Air-water relationship is favorable for plant growth. Rock fragments make up 5 to 25 percent of the soil profile.

Minimum and maximum values listed below represent the characteristic soils for the site.

Characteristic soils:

Bernal

Somordoro

Tuloso

**Table 4. Representative soil features**

Surface texture	(1) Cobbly loam (2) Stony silt loam (3) Fine sandy loam
Family particle size	(1) Sandy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to slow
Soil depth	8–20 in
Surface fragment cover ≤3"	15–35%
Surface fragment cover >3"	0–10%
Available water capacity (0-40in)	1–3 in
Calcium carbonate equivalent (0-40in)	0–5%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.4–8.4
Subsurface fragment volume ≤3" (Depth not specified)	15–35%
Subsurface fragment volume >3" (Depth not specified)	0–10%

## Ecological dynamics

Narrative from Legacy site:

"Overview

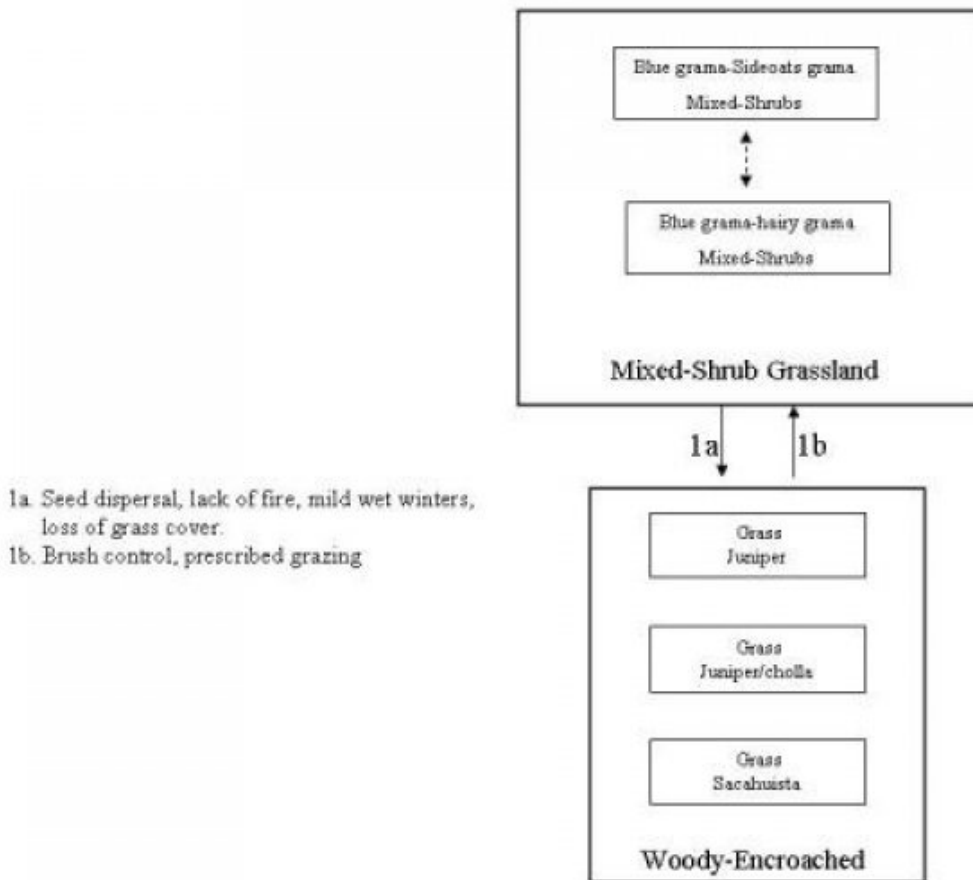
The Sandstone Savannah ecological site is associated with Shallow Sandstone, Sandy Loam, and Loamy sites. It typically occurs on hills, mesas, and dipslopes of cuestras. This site is dominated by warm-season short and mid-grasses, with scattered trees, shrubs and forbs. Grasses make up approximately 70 percent of the annual vegetative production. Shrubs and forbs are evenly distributed and can make up an important portion of the plant community. Juniper and piñon are often associated with very shallow soils along ledges and rock outcrop. Blue grama and sideoats grama are the dominant grasses of the reference plant community. Seed dispersal by livestock and wildlife, decreased fire frequency, loss of grass cover, and periods of mild wet winters may facilitate an increase in woody species."

Text from the Grazing Section that is relevant to plant ecology:

Continuous yearlong grazing or grazing continually during the potential growing season (April-October) by cattle will result in a decrease of species such as sideoats grama, little bluestem, New Mexico feathergrass, black grama, and winterfat. Species such as hairy grama, juniper, ring muhly, and broom snakeweed will increase. On sites with scattered juniper, continuous heavy grazing pressure will allow juniper to increase to give it the appearance of dominating the site. Fall and winter rest will benefit shrubby species such as winterfat. Spring rest (April-June) will allow cool-season grasses to mature. As the ecological condition deteriorates, it is accompanied by a sharp increase in juniper which may appear to dominate the site. Small patches of oak will also increase. As the reference plant community deteriorates, trees will monopolize resources, leading to a reduction in grass and forb cover.

## State and transition model

### MLRA 70, CP-2 Sandstone Savannah



## State 1 Historic Climax Plant Community

### Community 1.1 Historic Climax Plant Community

State Containing Historic Plant Community Mixed-Shrub Grassland: In the historic plant community, blue grama, and sideoats grama are the dominant grasses. Other species that typically occur in significant amounts include black grama, little bluestem, and New Mexico feathergrass. Common forbs include, bladderpod, Indian paintbrush, and globemallow. Juniper, winterfat, yucca, piñon, sacahuista, and skunkbush sumac are a few of the woody species common to this site. Continuous heavy grazing pressure can cause a decrease in sideoats grama, black grama, little bluestem, New Mexico feathergrass, and winterfat. Communities dominated by blue and hairy grama may result. Other subordinate species that typically increase in representation includes, ring muhly, threeawns,

wolftail, and broom snakeweed. Diagnosis: Species of grama grasses dominate the site. Grass cover is uniform with few large bare areas. Shrubs are present and evenly distributed. Combined canopy cover of shrubs and trees averages 10 percent. There is little evidence of erosion. Other grasses that may appear on this site include: spike muhly, silver bluestem, metcalf muhly, ring muhly, mat muhly, threeawns, alkali sacaton, pine dropseed, junegrass, dryland sedges, indian ricegrass, and galleta. Ther wood species may include: rabbitbrush, fourwing saltbush, sand sagebrush, threadleag groundsel, broom snakeweed, yucca species, sacauhista, and ponderosa pine. Other forbs may include: pentestemon spp. locoweed, red stem milkvetch, indian paintbrush, fetid marigold, sand verbina, wooly indianwheat, and tansy mustard.

**Table 5. Annual production by plant type**

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	280	560	840
Forb	60	120	180
Tree	40	80	120
Shrub/Vine	20	40	60
<b>Total</b>	<b>400</b>	<b>800</b>	<b>1200</b>

**Table 6. Soil surface cover**

Tree basal cover	0%
Shrub/vine/liana basal cover	5-15%
Grass/grasslike basal cover	15-25%
Forb basal cover	1-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	15-25%
Surface fragments >0.25" and <=3"	1-5%
Surface fragments >3"	15-25%
Bedrock	0%
Water	0%
Bare ground	20-30%

**Figure 5. Plant community growth curve (percent production by month). NM3718, R070AY018NM Sandstone Savanna HCPC. R070AY018NM Sandstone Savanna HCPC.**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	7	10	15	20	25	13	5	0	0

## State 2 Woody Encroached

This state contains a significant overstory of woody species.

### Community 2.1 Woody Encroached

Additional States: Woody-Encroached: This site is characterized by the noticeable increase of woody species including juniper, cholla, or sacahuista. These species may occur in combination or individually. Under proper grazing management grass communities tend to be similar to those that occur in the Mixed-Shrub Grassland state. Under continued heavy grazing pressure species such as ring muhly, threeawns, wolftail, and broom snakeweed

may continue to increase in representation. Diagnosis: Woody species, including juniper, cholla, or sacahuista are found at increased densities. Grass cover is variable ranging from fairly uniform to patchy with frequent large bare areas present. Rills and small gullies may be present especially on the steeper slopes. Wind scoured or depositional areas may be present as cover declines. Transition to Woody-Encroached (1a) ) Seed dispersal by livestock and wildlife and decreased fire frequency may facilitate the encroachment of juniper 1, cholla, and sacahuista.4 Variation in precipitation patterns such as a period of mild winters and above average precipitation may produce conditions favorable to the expansion of woody species initiating periods of increased recruitment and establishment. 3 Additionally, decreased grass cover may aid the establishment of woody species by providing competition free areas for seedling establishment. Key indicators of approach to transition: Decrease or change in distribution of grass cover. Increase in amount of woody seedlings. Transition back to Mixed-Shrub Grassland (1b) Brush control is necessary to reduce the canopy cover of woody species and maintain grass dominance. Periodic use of prescribed fire may be useful in reducing and maintaining shrub densities.2,4 Prescribed grazing will help ensure proper forage use following brush control.

## 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.

## Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Blue Grama hairy grama</b>			120–140	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	120–136	–
	hairy grama	BOHIH	<i>Bouteloua hirsuta var. hirsuta</i>	120–136	–
2	<b>Sideoats Grama</b>			120–140	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	126–136	–
3	<b>Little Bluestem</b>			120–140	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	120–136	–
4	<b>New mexico feathgrass</b>			60–70	
	New Mexico feathergrass	HENE5	<i>Hesperostipa neomexicana</i>	56–72	–
5	<b>needle and thread</b>			120–140	
	intermediate needle and thread	HECOI	<i>Hesperostipa comata ssp. intermedia</i>	120–136	–
6	<b>big bluestem</b>			10–60	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	12–60	–
7	<b>wolftail</b>			20–40	
	common wolftail	LYPH	<i>Lycurus phleoides</i>	24–40	–
8	<b>indiangrass</b>			10–60	
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	12–60	–
9	<b>threeawn species</b>			20	
	threeawn	ARIST	<i>Aristida</i>	16–24	–
10	<b>western wheatgrass</b>			10–60	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	12–60	–
11	<b>squirreltail</b>			10–35	
	squirreltail	ELEL5	<i>Elymus elymoides</i>	10–35	–

12	<b>sand dropseed</b>			10–60	
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	12–60	–
13	<b>pinion ricegrass, green needle</b>			10–60	
	green needlegrass	NAVI4	<i>Nassella viridula</i>	12–60	–
	pinyon ricegrass	PIFI	<i>Piptochaetium fimbriatum</i>	12–60	–
29	<b>mountain, plains muhly</b>			10–60	
	plains muhly	MUCU3	<i>Muhlenbergia cuspidata</i>	12–60	–
	mountain muhly	MUMO	<i>Muhlenbergia montana</i>	12–60	–
<b>Forb</b>					
14	<b>peavine , milkvetch</b>			10–60	
	Zuni milkvetch	ASAC2	<i>Astragalus accumbens</i>	12–60	–
	pea	LATHY	<i>Lathyrus</i>	8–24	–
16	<b>indian paintbrush</b>			0–20	
	scarlet Indian paintbrush	CACO17	<i>Castilleja coccinea</i>	0–16	–
17	<b>globe mallow</b>			10–60	
	globemallow	SPHAE	<i>Sphaeralcea</i>	12–60	–
19	<b>other forbs</b>			30–48	
	Forb, perennial	2FP	<i>Forb, perennial</i>	32–48	–
20	<b>annual forbs</b>			30–48	
	Forb, annual	2FA	<i>Forb, annual</i>	32–48	–
<b>Tree</b>					
21	<b>Juniper</b>			20–40	
	juniper	JUNIP	<i>Juniperus</i>	24–40	–
23	<b>Pinion Pine</b>			10–20	
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	8–24	–
<b>Shrub/Vine</b>					
22	<b>winterfat</b>			20–30	
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	16–32	–
25	<b>skunkbrush sumac</b>			10–20	
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	8–24	–
28	<b>sageworts</b>			10–60	
	Bigelow sage	ARBI3	<i>Artemisia bigelovii</i>	12–60	–
	field sagewort	ARCA12	<i>Artemisia campestris</i>	12–60	–
30	<b>oak</b>			10–60	
	oak	QUERC	<i>Quercus</i>	12–60	–
31	<b>mountain mahogany</b>			10–60	
	hairy mountain mahogany	CEMOP	<i>Cercocarpus montanus var. paucidentatus</i>	12–60	–

## Animal community

Habitat for Wildlife: This site provides habitat which supports a resident animal community that is characterized by mule deer, bobcat, spotted skunk, eastern cottontail, rock squirrel, rock mouse, great horned owl, scrub jay, canyon wren, prairie rattlesnake, and eastern fence lizard. There is nesting use of the juniper and shrub foliage by roadrunner, magpie, mockingbird, and loggerhead shrike.

## 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  
Bernal B  
Sombordoro D  
Tuloso D

## Recreational uses

This site has good aesthetic appeal and natural beauty with its large variety of plants that bloom from early spring to late fall. The physiographic features break the "wide open space" of the plains. This site has fair suitability for camping, hiking and picnicking. Hunting is fair for deer, rabbits and fair to good for quail. This site provides fair screening. Photography and birdwatching for small bird and raptors are fair.

## Wood products

This site has potential for wood products which is limited to fuelwood and fence material. However, if the site moves to tree dominance, as much as 6 to 10 cords of fuelwood per acre may be harvested annually. Harvesting should be selective by hand cutting. Tree scaping of D plus 15 is recommended.

## Other products

Grazing: This site can be grazed any season of the year by all classes and ages of livestock. Because of the slopes and rock outcrops, a younger age of livestock utilizes this site the best. Browsing animals should be considered because of the site's potential to produce shrubs and forbs. Continuous yearlong grazing or grazing continually during the potential growing season (April-October) by cattle will result in a decrease of species such as sideoats grama, little bluestem, New Mexico feathergrass, black grama, and winterfat. Species such as hairy grama, juniper, ring muhly, and broom snakeweed will increase. On sites with scattered juniper, continuous heavy grazing pressure will allow juniper to increase to give the appearance of dominating the site. A system of deferred grazing by domestic livestock, which varies the season of grazing and rest during successive years, will result in a healthy, well-balance plant community. Fall and winter rest will benefit shrubby species such as winterfat. Spring rest (April-June) will allow cool-season grasses to mature. Cattle show a definite seasonal preference for black grama, and usually utilize it heavily from January to March. A large variety of grasses, forbs, and shrubs provide a well-balanced feed and good nutrition for all grazing animals. Ninety percent of the annual production is from species that provide forage for grazing animals. As the ecological condition deteriorates it is accompanied by a sharp increase in juniper, which may appear to dominate the site. Small patches of oak will also increase. As the reference community deteriorates, trees will monopolize resources, leading to a reduction in grass and forb cover.

## Other information

Other Information: Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index-----Ac/AUM  
76 plus-----3.2 to 4.2  
50-----4 to 6  
25-----5.9 to 16  
0-----16 plus

## Inventory data 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: San Miguel, Quay, Guadalupe, De Baca and Chaves



## Other references

References.

1. Johnsen, T.N., Jr. 1962. One-seeded juniper invasion of northern Arizona grasslands. *Ecological Monographs*. 32:187-207.
2. Johnson, D.E., H. A. M. Mukhtar, R. Mapston, and R.R. Humphrey. 1962. The mortality of oak-juniper woodland species following a wildfire. *Journal of Range Management* 15: 201-205
3. Miller, R.F., and R.J. Tausch. 2001. The role of fire in pinyon and juniper woodlands: a descriptive analysis. Pages 15–30 in K.E.M. Galley and T.P. Wilson (eds.). *Proceedings of the Invasive Species Workshop: the Role of Fire in the Control and Spread of Invasive Species. Fire Conference 2000: the First National Congress on Fire Ecology, Prevention, and Management*. Miscellaneous Publication No. 11, Tall Timbers Research Station, Tallahassee, FL.
4. Van Dyne, G.M., G.F. Payne, compilers. 1964. *Grazing responses of western range plants*. Bozeman, MT: Montana State College, Department of Animal and Range Sciences. 69 p.

## Contributors

Don Sylvester  
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## Approval

Kendra Moseley, 9/12/2023

## 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	02/26/2024
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:**
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2. **Presence of water flow patterns:**
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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):**

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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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