

Ecological site R035XG122NM Sandstone Hills

Last updated: 5/19/2025

Accessed: 05/20/2025

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.

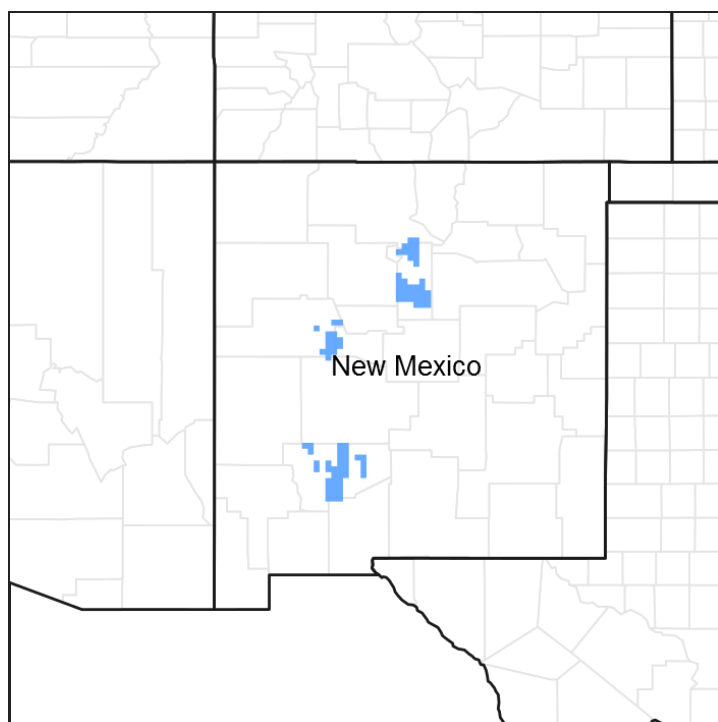


Figure 1. Mapped extent

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 sandstone-derived soils that are typically shallow or very shallow to bedrock. Rock outcrop is often present. Slope is quite variable.

Table 1. Dominant plant species

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

Physiographic features

The topography of this site varies from moderately steep to steep and occurs frequently in association with sandstone outcrop or badlands. Slopes generally exceed 15 percent and may on occasion range as high as 70 percent. Elevations range from about 6000 to 7800 feet.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Mesa
Flooding frequency	None
Ponding frequency	None
Elevation	1,829–2,377 m
Slope	15–70%
Aspect	Aspect is not a significant factor

Climatic features

Average annual precipitation varies from about 10 inches to just over 16 inches. Fluctuations ranging from about 5 inches to 25 inches are not uncommon. The overall climate is characterized by cold dry winters in which winter moisture is less than summer. As much as half or more of the annual precipitation can be expected to come during the period of July through September. Thus, fall conditions are often more favorable for good growth of cool-season perennial grasses, shrubs, and forbs than are those of spring.

The average frost-free season is about 120 days and extends from approximately mid-May to early or mid-September. Average annual air temperatures are 50 degrees F or lower and summer maximums rarely exceed 100 degrees F. Winter minimums typically approach or go below zero. Monthly mean temperatures exceed 70 degrees F for the period of July and August.

Rainfall patterns generally favor warm-season perennial vegetation, while the temperature regime tends to favor cool-season vegetation. This creates a somewhat complex community of plants on a given range site which is quite susceptible to disturbance and is at or near its productive potential only when both natural warm- and cool- season dominants are present.

Table 3. Representative climatic features

Frost-free period (average)	171 days
Freeze-free period (average)	252 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 moisture from landforms above and contribute runoff to landforms below.

Soil features

The soils found on this site are generally shallow to very shallow over sandstone. Surface textures are typically sandy loams, fine sandy loams, very fine sandy loams or loams, which often are gravelly, stony, or cobbly. Pockets of deeper soils occur in association with the site as well as occasional to frequent outcroppings of sandstone and badlands, either of which may affect livestock movements. Typically, permeability is moderate to moderately rapid, and the available water capacity is low.

Table 4. Representative soil features

Surface texture	(1) Gravelly sandy loam (2) Stony fine sandy loam (3) Cobbly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	0–51 cm
Surface fragment cover ≤3"	20–40%
Surface fragment cover >3"	5–10%
Available water capacity (0-101.6cm)	2.54–7.62 cm
Calcium carbonate equivalent (0-101.6cm)	1–10%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm

Sodium adsorption ratio (0-101.6cm)	0–4
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	15–40%
Subsurface fragment volume >3" (Depth not specified)	5–10%

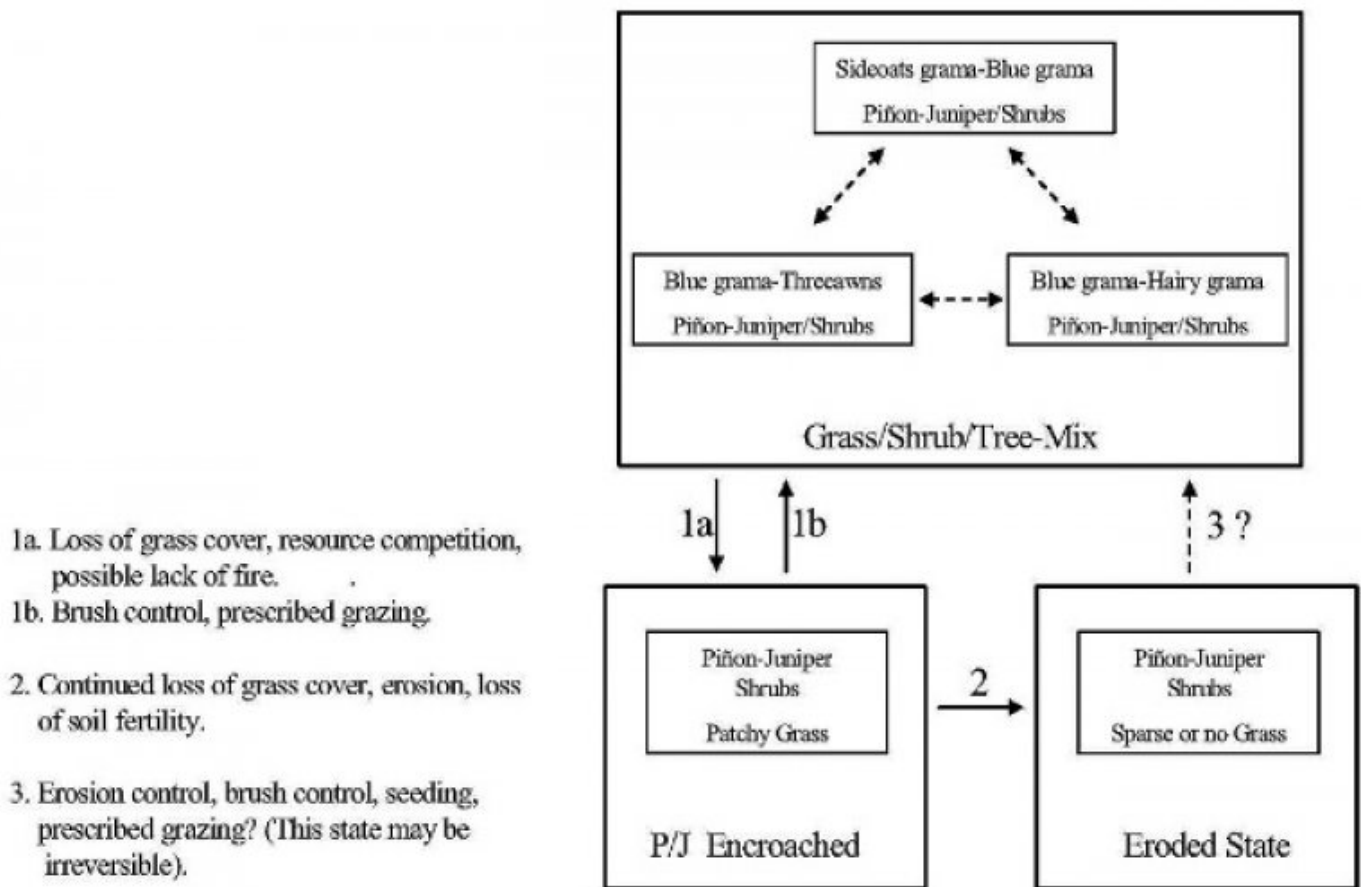
Ecological dynamics

Overview

This site occurs on hills and ridges, the soils are shallow to sandstone and areas of sandstone outcrop are common, especially along ledges and escarpments. This site is associated with loamy sites that occur along drainageways or depressions dissecting Sandstone Hills. This is a moderately productive site characterized by a mixture of warm and cool-season grasses, shrubs, and scattered trees. Sideoats grama, blue grama, little bluestem, Indian ricegrass, New Mexico feathergrass, galleta, and occasionally black grama are grasses common to this site. Piñon pine and juniper species characterize the tree aspect, while shrubs including skunkbush sumac, oak, mountain mahogany, and winterfat are common shrub species. The loss of grass cover and the associated decrease in resource competition by grasses are believed to facilitate the encroachment of woody species and initiate the transition to the Piñon-Juniper Encroached state. A decrease in the natural fire frequency may facilitate this transition, if fire historically occurred on this site following periods of favorable grass production. Brush control in conjunction with prescribed grazing is necessary to remove the competitive advantage of shrubs and trees and reestablish grass dominance. Loss of herbaceous cover combined with steep slopes and sandy surface textures make this site highly susceptible to both water and wind erosion. Once the transition to an Eroded State has occurred, the ability to reverse the transition is constrained by low precipitation, low available water capacity, steep slope, shallow soils, and soil degradation.

State and transition model

MLRA 36, WP-2 Sandstone Hills



State 1 Reference State

This state represents the most ecologically stable conditions in terms of resistance to erosion. Moreover, this state has the highest potential for productivity and plant diversity.

Community 1.1 Reference Plant Community

State Containing Historic Plant Community Grass/Shrub/Tree-Mix: Grasses are the dominant component of the historic plant community. Sideoats grama is the dominant grass with blue grama occurring as the sub-dominant. Little bluestem, Indian ricegrass, New Mexico feathergrass, and galleta are also common. Black grama is favored at lower elevations, while grasses such as pine dropseed, Arizona fescue, muttongrass, and prairie junegrass may increase in representation at higher elevations. Shrub species such as mountain mahogany, and oak are favored at higher elevations. Shrubs and half-shrubs such as winterfat are common. Bigelow sagebrush, spineless horsebrush, and broom snakeweed are encountered in small amounts. Oneseed juniper is often the most common tree at lower to mid elevations, with piñon increasing at higher elevations. Changes in composition to the historic plant community may occur due to overgrazing and

drought. Species such as sideoats grama, little bluestem, many of the cool-season grasses, mountain mahogany, and winterfat typically decrease in response to overgrazing. A blue grama-threeawn or blue grama-hairy grama dominated community may result. Diagnosis: Grasses are dominant and cover is fairly uniform with few large bare areas present. Trees and shrubs are common with a combined canopy cover averaging fifteen percent. Evidence of erosion such as pedestalling of grasses, rills and gullies are infrequent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	168	347	527
Forb	11	34	56
Total	179	381	583

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	5-10%
Surface fragments >0.25" and <=3"	20-40%
Surface fragments >3"	5-10%
Bedrock	0%
Water	0%
Bare ground	45-50%

Figure 5. Plant community growth curve (percent production by month). NM0313, R035XG122NM-Sandstone Hills-HCPC. WP-2 Mixed warm/cool season grassland with shrubs and scattered trees..

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

Piñon/Juniper-Encroached

This state is characterized by a robust overstory of piñon/juniper.

Community 2.1

Pinon/Juniper-Encroached

Additional States: Piñon-Juniper Encroached: This state is characterized by an increase of piñon and/or juniper. Piñon tends to dominate at higher elevations, giving way to juniper at lower elevations. Other woody species such as oakbrush, rabbitbrush, spineless horsebrush, and Bigelow sagebrush may also increase in representation. Blue grama is typically the dominant grass species. **Diagnosis:** Piñon and juniper are found at increased densities relative to the Grass/Shrub/Tree-Mix. Grass cover is patchy with large bare areas present. Blue grama is typically the dominant grass species. **Evidence of erosion** such as pedestalling of plants, elongated water flow patterns, litter dams, and rills may be common. **Transition to Piñon-Juniper Encroached (1a)** Persistent loss of grass cover, the associated decreased competition by grasses, and lack of fire are believed to facilitate the encroachment of piñon/juniper.^{1,3, 5, 7} Loss of herbaceous cover due to overgrazing and drought can provide competition free areas for piñon/juniper seedling establishment, and afford a competitive advantage to established woody species. However, the natural spatial variability of ground cover may also allow woody species to establish on existing bare areas.⁴ As piñon/juniper canopy cover increases, total herbaceous biomass decreases.⁶ Loss of herbaceous cover can also reduce fuel levels beyond the point capable of carrying fire. If fire was historically important in the development of plant communities on Sandstone Hills ecological sites by suppressing piñon/juniper seedlings, then disruption of natural fire frequency may facilitate piñon/juniper encroachment.⁵ **Key indicators of approach to transition:** * Decrease or change in composition or distribution of grass cover. * Increase in size and frequency of bare patches. * Increase in amount of juniper, piñon, and shrub seedlings. **Transition back to Grass/Shrub/Tree-Mix (1b)** Brush control is necessary to reduce the competitive influence of piñon/juniper and facilitate grass recovery. Prescribed grazing will help ensure adequate rest following brush control and will assist in the establishment and maintenance of grass cover.

State 3

Eroded State

This state shows evidence of significant erosion such as truncated topsoil and/or pedestalling at the surface.

Community 3.1

Eroded State

Eroded State: This state is characterized by accelerated erosion and loss of soil fertility. **Diagnosis:** Grass cover is minimal usually restricted to scattered patches of blue grama or widely scattered individual bunchgrasses. Rills, gullies, and blowout areas are common often exposing areas of bedrock and tree roots. **Transition to Eroded State (2)** Continued

loss of grass cover and loss of soil fertility in conjunction with accelerated wind and water erosion can initiate the transition to an Eroded State. Steep slopes, sandy loam textures, and shallow soil depth make this site susceptible to accelerated erosion if adequate cover is not maintained. 2 Key indicators of approach to transition: * Decrease in grass and litter cover. * Pedestalling of plants. * Wind scoured areas. * The presence of rills and small gullies. Transition back to Grass/Shrub/Tree-Mix (3)? Once the transition to an Eroded State has occurred, the ability to reverse the transition is constrained by low precipitation, low available water capacity, steep slope, shallow soils, and soil degradation. Brush control will be necessary to reduce competition for resources by piñon/juniper. Erosion control structures in conjunction with seeding will be necessary to reestablish hydrology and grass dominance. Prescribed grazing will help ensure adequate rest following seeding and brush control practices and will assist in the establishment and maintenance of grass cover. The degree to which this site is capable of recovery is dependent on the extent of degradation to the soil resources.

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				90–135	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	93–139	—
2				45–67	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	46–69	—
3				22–45	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	24–46	—
4				22–45	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	24–46	—
	pine dropseed	BLTR	<i>Blepharoneuron tricholepis</i>	24–46	—
	Arizona fescue	FEAR2	<i>Festuca arizonica</i>	24–46	—
	sheep fescue	FEOV	<i>Festuca ovina</i>	24–46	—
	mountain muhly	MUMO	<i>Muhlenbergia montana</i>	24–46	—
5				45–67	
	squirreltail	ELEL5	<i>Elymus elymoides</i>	46–69	—
	needle and thread	HECO26	<i>Hesperostipa comata</i>	46–69	—
	New Mexico feathergrass	HENE5	<i>Hesperostipa neomexicana</i>	46–69	—
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	46–69	—

	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	46–69	–
	muttongrass	POFE	<i>Poa fendleriana</i>	46–69	–
6				45–22	
	spike muhly	MUWR	<i>Muhlenbergia wrightii</i>	4–24	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	4–24	–
7				0–11	
	threeawn	ARIST	<i>Aristida</i>	4–13	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	4–13	–
	common wolfstail	LYPH	<i>Lycurus phleoides</i>	4–13	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	4–13	–
8				0–22	
	black grama	BOER4	<i>Bouteloua eriopoda</i>	4–24	–
Tree					
9				22–45	
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	24–46	–
	juniper	JUNIP	<i>Juniperus</i>	24–46	–
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	24–46	–
Shrub/Vine					
10				0–22	
	alderleaf mountain mahogany	CEMO2	<i>Cercocarpus montanus</i>	4–24	–
	oak	QUERC	<i>Quercus</i>	4–24	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	4–24	–
11				0–22	
	Bigelow sage	ARBI3	<i>Artemisia bigelovii</i>	4–24	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	4–24	–
12				0–11	
	rubber rabbitbrush	ERNAN5	<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>nauseosa</i>	4–15	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	4–15	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	4–15	–
Forb					

13				11–34	
	Forb, perennial	2FP	<i>Forb, perennial</i>	13–37	–
14				0–11	
	Forb, annual	2FA	<i>Forb, annual</i>	4–13	–

Animal community

This range site provides habitats which support a resident animal community that is characterized by mule deer, gray fox, bobcat, desert cottontail, cliff chipmunk, rock squirrel, Stephen's woodrat, pinyon mouse, harlequin quail, red-shafted flicker, scrub jay, pinyon jay, bridled titmouse, common bushtit, rufous-sided towhee, chipping sparrow, red-spotted toad, collared lizard, tree lizard, desert short-horned lizard, mountain patch-nosed snake, and blacktailed rattlesnake.

Where cliffs and ledges are found associated with the site, golden eagle, great horned owl, prairie falcon, Say's phoebe, white- throated swift, and cliff swallow nest or hunt over this site. Mourning dove and black- hinned sparrow nest on the site. Where it occurs adjacent to the ponderosa pine forests, elk may range in to feed. In high production years, Merriam's turkey and band- ailed pigeon feed on this site. The western bluebird winters and the mountain lion occasionally hunts on this site.

Hydrological functions

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

Recreational uses

The site has moderate to high potential for semi-improved picnicking and camping sites which are designed with erosion hazard and other problems inherent to shallow soils in mind. It also offers potential for hiking, horseback riding, hunting, nature observation, and photography. On occasion, ancient and gnarled junipers are found which, for many, provide a very striking source of natural beauty. This is especially true when they are seen against a backdrop of distant openspace landscapes typical of the region in which the site is found.

Wood products

This site has a limited potential for wood products, which is restricted almost entirely to fence post and firewood products.

Other products

This site is suitable for grazing by most kinds and classes of livestock without regard to season of the year. Where slopes are steep, however, accessibility may become limited and stocking rates need to be properly adjusted. Deterioration of the potential plant community due to inadequately managed grazing is usually typified by an increase in low-value grasses such as threeawns and hairy grama as well as such woody species as pinyon, juniper, rabbitbrush, oakbrush, and broom snakeweed. Under severe deterioration, erosion hazard becomes quite high, and the site may become severely limited for grazing. Mechanical brush control and seeding are generally impractical on the site due to shallow soils and steep slopes, and recovery using improved grazing management alone, is very slowly achieved.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index Ac/AUM

100 - 76-----	4.5 - 5.5
75 – 51-----	5.2 - 8.0
50 – 26-----	7.5 - 15.0
25 – 0-----	15.0 +

Other references

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3. Johnsen, T.N., Jr. 1962. One-seeded juniper invasion of northern Arizona grasslands. *Ecological Monographs*. 32:187-207.
4. Jurena, P.N. and S. Archer. 2003. Woody plant establishment and spatial heterogeneity in Grasslands. *Ecology* 84: 907-919
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Data collection for this site was done in conjunction with the progressive soil surveys within the New Mexico and Arizona Plateaus & Mesas Major Land Resource Area of New Mexico. This site has been mapped and correlated with soils in the following soil surveys: McKinley, Catron, Cibola, Socorro and Sandoval.

Contributors

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Approval

Kendra Moseley, 5/19/2025

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	05/20/2025
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:**
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17. **Perennial plant reproductive capability:**
-