Ecological site R077BY009NM
Gravelly

Last updated: 9/11/2023
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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.

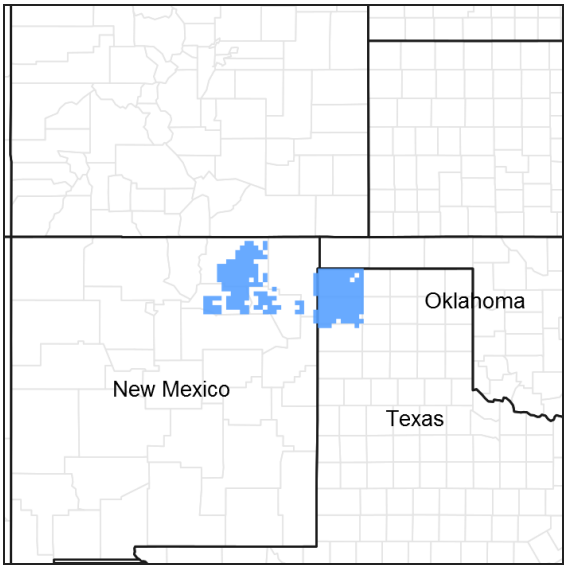


Figure 1. Mapped extent

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): 077B–Southern High Plains, Northwestern Part

MLRA 77B is characterized by nearly level to gently sloping plains with a minimal number of playa depressions and moderately sloping breaks along drainageways. Loamy and sandy soils are generally deep and occur in a mesic soil temperature regime and ustic soil moisture regime bordering on aridic. Current land use is dominantly rangeland with minor cropland.

Classification relationships

This ecological site is correlated to soil components at the Major Land Resource Area (MLRA) level which is further described in USDA Ag Handbook 296.

Ecological site concept

The Gravelly ecosite occurs over deep, gravelly soils on uplands. These soils may be loamy to sandy. The reference vegetation consists of midgrasses and shortgrasses with scattered forbs and shrubs. Abusive grazing practices can lead to a decline in the more palatable species and a shift in the plant community. Without fire or alternative brush management activities, woody species canopy may increase across the site. This site may have

up to 35 percent surface gravel present.

Associated sites

R077BY021TX	**Sandy Loam 12-17" PZ** Generally adjacent and upslope of the gravelly site. The soils have sandy loam surface textures with loam to sandy clay loam subsoil textures. Midgrasses dominate this with a good mixture of tallgrasses on this site. More productive than the gravelly site.
R077BY014TX	**Deep Hardland 12-17" PZ** Generally adjacent and upslope of the gravelly site. The soils have loam surface textures with clay loam to clay subsoil textures. Shortgrasses dominate but has a good mixture of midgrasses this site. More productive than the gravelly site.
R077BY016TX	**Limy Upland 12-17" PZ** Generally adjacent and upslope of the gravelly site. The soils have sandy loam to loam surface textures with loam to clay loam subsoil textures. These soils are highly calcareous. Shortgrasses dominate but there is a good mixture of midgrasses on this site. More productive than the gravelly site.
R077BY700TX	**Sandy Bottomland 12-17" PZ** Generally adjacent and downslope of the gravelly site. The soils have sandy loam surface textures. This site receives runoff from the gravelly site. Tallgrasses dominate this site but has a good mixture of midgrasses on this site. More productive than the gravelly site.

Similar sites

R077EY053TX	**Gravelly 16-24" PZ** This site has deep to very deep gravelly sandy loam to loam soils like the gravelly site of MLRA 77B. Mean annual precipitation is higher (16 to 24 inches). Midgrasses dominate this site. More productive than the MLRA 77B gravelly site.
R077BY026NM	**Gravelly Loam** This site has deep gravelly loam soils. Midgrasses dominate but there is a good mixture of shortgrasses on this site. Generally more productive than the gravelly site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Chrysothamnus viscidiflorus* (2) *Gutierrezia sarothrae*
Herbaceous	(1) *Bouteloua curtipendula* (2) *Schizachyrium scoparium*

Physiographic features

This site is located on the convex terraces along the tops of ridges and on slopes between low ridges. Slopes are convex and range from 1 to 25 percent. Elevation ranges from 3,700 to 5,900 feet above sea level. The exposure varies and is significant only on the moderately steep north facing slopes.

Table 2. Representative physiographic features

Landforms	(1) Plateau > Hillslope (2) Plateau > Ridge (3) Plateau > Terrace
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	3,700–5,900 ft
Slope	1–25%

Water table depth	80 in
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

Climate is semi-arid dry steppe. Summers are hot with winters being generally mild with numerous cold fronts that drop temperatures into the single digits for 24 to 48 hours. Temperature extremes are the rule rather than the exception. Humidity is generally low and evaporation high. Wind speeds are highest in the spring and are generally southwesterly. Canadian and Pacific cold fronts come through the region in fall, winter and spring with predictability and temperature changes can be rapid. Most of the precipitation comes in the form of rain and during the period from May through October. Snowfall averages around 15 inches but may be as little as 8 inches or as much as 36 inches. Rainfall in the growing season often comes as intense showers of relatively short duration. Long-term droughts occur on the average of once every 20 years and may last as long as five to six years (during these drought years, moisture during the growing season is from 50 to 60 percent of the mean). Based on long-term records, approximately 60 percent of the years are below the mean rainfall and approximately 40 percent are above the mean. May, June and July are the main growth months for perennial warm-season grasses. Forbs make their growth somewhat earlier.

Table 3. Representative climatic features

Frost-free period (characteristic range)	140-147 days
Freeze-free period (characteristic range)	169-172 days
Precipitation total (characteristic range)	16-17 in
Frost-free period (actual range)	139-148 days
Freeze-free period (actual range)	168-175 days
Precipitation total (actual range)	16-18 in
Frost-free period (average)	144 days
Freeze-free period (average)	171 days
Precipitation total (average)	17 in

Climate stations used

- (1) AMISTAD 5 SSW [USC00290377], Amistad, NM
- (2) DALHART 6 SW [USC00412235], Hartley, TX
- (3) CLAYTON MUNI AIR PK [USW00023051], Clayton, NM
- (4) ROSEBUD 7NW [USC00297585], Mosquero, NM
- (5) MCCARTY RCH [USC00295516], Nara Visa, NM

Influencing water features

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

Wetland description

None.

Soil features

The soils of the site are deep and excessively drained. The surface layer ranges from loam to loamy sand about 4 to 7 inches thick. The underlying layer of loam to sand extends to a depth of 60 inches or more. The soils have moderately rapid to rapid permeability. The available water-holding capacity is low. The plant-soil-water-air relationship is fair to good. Because of the surface texture and rapid drying of the surface, is unprotected by plant cover and organic residue, it becomes wind blown and hummocks or dunes are formed around shrubs.

Major Soil Taxonomic Units correlated to this site include: Guy gravelly loam.

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous, metamorphic and sedimentary rock
Surface texture	(1) Gravelly loam (2) Gravelly fine sandy loam (3) Gravelly loamy fine sand
Family particle size	(1) Coarse-loamy
Drainage class	Well drained to excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	80 in
Surface fragment cover <=3"	0–50%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	3–6 in
Calcium carbonate equivalent (0-40in)	5–40%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–1
Soil reaction (1:1 water) (0-40in)	7.9–9
Subsurface fragment volume <=3" (0-40in)	20–40%
Subsurface fragment volume >3" (0-40in)	2–6%

Ecological dynamics

The reference plant community consists of midgrasses and shortgrasses with scattered forbs and shrubs. Little bluestem and sideoats grama dominate this plant community. This vegetation on this site developed under periods of periodic fire and periodic grazing.

Fire plays a major role in maintaining the reference community. In general, woody plants are suppressed and grasses are perpetuated. Fire also influences grazing patterns. Animals were attracted to the re-growth of herbage in burned areas. Forbs become more profuse for a time following fire and attracted animals such as pronghorns that prefer forbs to grass. Fire in combination with a favorable growing season will generally tend to sustain the perennial midgrass/shortgrass community.

This ecological site developed under a grazing ecology. Large herbivores grazed the grass- lands and moved on seeking fresh forage. On the high plains plateau, the frequency of grazing was greatly influenced by availability of water. There are historical accounts of Spanish conquistadors encountering buffalo as the parties crossed the plains. Large amounts of water were needed to support the huge bison herds. During dry times the herds most likely grazed the edge of the plains near the breaks leading to the creeks and rivers. When grazing did occur it was probably severe. Recovery periods likely were long with the animals not returning to the same spot for several years.

Grazing:

This site can be grazed any season of the year by all kinds of livestock, generally without regard to age. A portion of the total stocking rate favors sheep and antelope due to the site's potential to produce forbs. The large variety of plants provides good nutrition during most seasons of the year. Supplemental protein is needed only during late winter. Emergency feed is required during heavy snow cover; however, this site is among the first that the snow will melt off. This site is among the first to "green-up" in the spring and will usually respond to light amounts of rainfall. Continuous year long grazing or grazing continually by cattle during the period from April through October will cause the site to deteriorate and become less productive. Species such as sideoats grama, little bluestem, New Mexico feathergrass, needleandthread and winterfat will decrease and
blue grama, threeawn spp., wolftail, tridens, broom snakeweed and forbs will increase. A system of deferred grazing, which varies the season of grazing and rest in each pasture during successive years, is needed to maintain or improve the plant community. Different seasons of rest and grazing benefit different plants. Spring rest (April – June) will allow cool-season forbs and grasses such as New Mexico feathergrass and needleandthread to grow and reproduce. Summer rest will benefit warm-season grasses such as sideoats grama, little bluestem and blue grama. Fall rest allows plants to complete their growth cycle. Winter rest will benefit the woody species such as winterfat and sagebrush. Grazing is beneficial after the seed set and aids in trampling in the seed.

Abusive grazing practices can lead to a decline in the more palatable species and a shift in the plant community. Without fire or alternative brush management activities, woody species canopy may increase across the site. This site may have up to 35 percent surface gravel present.

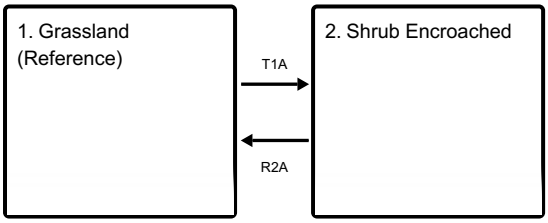
A state-and-transition model diagram for the Gravelly ecological site is shown after this narrative. The descriptions of each state, transition, and recovery pathway are listed. The model is based on expert evaluation of available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.

Plant community response differs across the MLRA because of the naturally occurring variability in weather, soils, and aspect. The reference community phase is not necessarily the management goal. Other vegetative states may be desired plant communities if range health assessments are in the moderate category and above. The biological processes on this site are complex. Representative values are therefore presented in a land management context. The species lists are representative. They are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

Percent species composition by weight, percent canopy cover, and other metrics may be described. Most observers find it easier to visualize or estimate percent canopy for woody species (trees and shrubs) than to visualize or estimate production by weight. Because of the influence of shade and interception of rainfall, canopy cover can drive the transitions between communities and states. Species composition by dry weight is used for describing the herbaceous community and the community as a whole. Woody species are included in species composition for the site.

State and transition model

Ecosystem states



T1A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

R2A - Adequate rest from defoliation and removal of woody canopy, followed by reintroduction of historic disturbance regimes

State 1 submodel, plant communities

1.1. Reference Plant Community

State 1
Grassland (Reference)

This ecological state is considered the reference state for the Gravelly ecological site. It represents the historical range of variability on the site under reference conditions(periodic fire/grazing). It is dominated by herbaceous plants, mainly grasses, with some scattered shrubs.

Community 1.1
Reference Plant Community

Reference Plant Community This site is grassland dominated by warm-season short and mid grasses dotted with half-shrubs. Woody species, forbs and cool-season grasses make up an important component of the plant community and are evenly distributed. Dominant grasses are little bluestem(*Schizachyrium scoparium*) and sideoats grama(Boutelous curtipendula) along with blue grama(*Bouteloua gracilis*). Forbs and shrubs and cool season grasses also occur throughout the site in smaller numbers. Annual vegetative production estimates range from 250 to 800 pounds per acre depending on weather conditions. Some records even indicate production near 1,100 pounds per acre with above average rainfall but this should not be expected.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	183	383	584
Forb	33	68	104
Shrub/Vine	33	68	104
Total	**249**	**519**	**792**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	5-10%
Grass/grasslike foliar cover	10-20%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	10-15%
Surface fragments >0.25" and <=3"	0-5%
Surface fragments >3"	15-20%
Bedrock	0%
Water	0%
Bare ground	0%

Figure 9. Plant community growth curve (percent production by month). NM4709, R077BY009NM Gravelly Reference State. R077BY009NM Gravelly Reference State.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	2	4	6	10	10	25	30	10	3	0	0

State 2
Shrub Encroached

This state is the result of an crease in woody plants. Woody canopy cover exceeds 25 percent. Ecological process are greatly influenced by the shrubs on the site as they outcompete herbaceous plants for sunlight, water, and nutrients. As the herbaceous plant community shrinks, so does the available forage for grazing animals. This can lead to overgrazing if stocking rates are not adjusted. Overall production of the site may be similar to the Grassland state, but woody plants will make up a much larger percentage of the total.

Transition T1A
State 1 to 2

Without periodic fire, or alternative forms of brush management, the woody species may expand across the site both in abundance and canopy. As woody canopy coverage exceeds 25 percent, the site may transition to the Shrub Encroached state(2). It is important to note that while grazing, alone, may not directly cause in increase in woody canopy, overgrazing can greatly reduce the effectiveness of prescribed fires and the ability to implement them.

Restoration pathway R2A
State 2 to 1

With the implementation of prescribed fire or other brush management practices, the site may be restored to the Grassland state. This restoration may take multiple years depending on prior management, weather patterns, and practices used. It is important to note that grazing management plays a vital role in the success of the restoration process. Fine fuels are needed to implement a successful prescribed fire. If chemical or mechanical brush management is used, deferment after treatment is often necessary to allow recovery of herbaceous plants.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Hairy Grama, Blue Grama, Ltle Blstm, Sideoats Gram**			79–105	
	sideoats grama	BOCU	*Bouteloua curtipendula*	79–105	–
	blue grama	BOGR2	*Bouteloua gracilis*	79–105	–
	copper fern	BOHI	*Bommeria hispida*	79–105	–
	little bluestem	SCSC	*Schizachyrium scoparium*	79–105	–
2	**Wolftail**			16–26	
	common wolfstail	LYPH	*Lycurus phleoides*	16–26	–
3	**New Mexico Feathergrass, Needleandthread**			53–79	
	needle and thread	HECO26	*Hesperostipa comata*	53–79	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	53–79	–
4	**Threeawn spp.**			16–26	
	threeawn	ARIST	*Aristida*	16–26	–
5	**Other Grasses**			16–26	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	16–26	–
Forb					
6	**Prairie Coneflwr, Buckwht sp., Per Forbs, An For**			16–26	
	Forb, annual	2FA	*Forb, annual*	16–26	–
	Forb, perennial	2FP	*Forb, perennial*	16–26	–
	buckwheat	ERIOG	*Eriogonum*	16–26	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	16–26	–
Shrub/Vine					
7	**Yucca spp.**			16–26	
	yucca	YUCCA	*Yucca*	16–26	–
8	**Gambel Oak**			16–26	
	Gambel oak	QUGA	*Quercus gambelii*	16–26	–
9	**Bigelow Sagebrush, Fringed Sagewort, Other Shrubs**			16–26	
	Shrub, deciduous	2SD	*Shrub, deciduous*	16–26	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	16–26	–
	prairie sagewort	ARFR4	*Artemisia frigida*	16–26	–

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
Guy----------B

Recreational uses

This site provides limited recreation potential due to the lack of live water and shade. It is poor for screening. Hiking, camping, and picnicking are fair. Hunting is fair to good for antelope, rabbits and upland game birds. This site has fair aesthetic appeal and natural beauty due to the large variety of forbs that bloom from spring to fall.

Wood products

This site has no potential for wood products.

Inventory data references

NRCS FOTG – Section II of the FOTG Range Site Descriptions and numerous historical accounts of vegetative conditions at the time of early settlement in the area were used in the development of this site description.

Type locality

Location 1: Colfax County, NM
Location 2: Harding County, NM
Location 3: Union County, NM

Other references

Data collection for this site was done in conjunction with the progressive soil surveys within the Southern High Plains 77 Major Land Resource Area of New Mexico. This site has been mapped and correlated with soils in the following soil surveys: Union, Harding Colfax.

This ESD was edited in 2017 as part of an MLRA 77B PESD project. A draft state and transition model was added as well as narratives for states, transitions, and restoration pathways.

Colin Walden - Range Management Specialist, Soil Survey Region 9

Contributors

Christine Bishop
Don Sylvester
Wendy McCoy
Todd Carr

Approval

Bryan Christensen, 9/11/2023

Acknowledgments

Site Development and Testing Plan:
Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.
Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.

Colin Walden - Range Management Specialist, Soil Survey Region 9

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)	John Tunberg
Contact for lead author	505-761-4488
Date	03/01/2010
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills not present on slopes < 10% and gravel cover > 50%. A few short rills where slope increases. After wildfires, or abnormally high human or herbivore impacts or extended drought or combinations of these disturbances rills may double in number on slopes greater than 10% after high-intensity summer thunderstorms.

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2. **Presence of water flow patterns:** Water flow patterns short 1 to 3 meters and discontinuous on slope < 10%. They may increase in length on steeper slopes to 5 to 10 meters. Should only be present following intense storm events. Numerous obstructions alter flow paths. Flow pattern length and numbers may double after wildfires, or abnormally high human or herbivore impacts or extended drought or combinations of these disturbances.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals less than .5 inches high. And terracettes 1 to 2 inches high. These would be in water flow patterns on slopes greater than 10%.Wind caused pedestals are rare and only would be on the site following after wildfires, or abnormally high human or herbivore impacts or extended drought or combinations of these disturbances. Slightly more pedestals would be expected on slopes ranging greater than 10% after high-intensity summer thunderstorms. These would show signs of healing within 1 year after severe storm event.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10% with bare ground less than 8 to 10 inches in diameter in the intervals between natural disturbance events. Bare ground would be expected to increase to 80% or more the first year following wildfire and then decrease to pre fire levels within 2 to 5 years. High percent of surface rock cover accounts for relatively low expected bare ground.

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5. **Number of gullies and erosion associated with gullies:** Drainages where present are stabilized with native veg. No signs of active erosion. After high-intensity summer thunderstorms or after wildfire, or abnormally high human or herbivore impacts or extended drought or combinations of these disturbances gully formation would be accelerated for a year or two. Evidence of healing within 1 year of event and continuing after that.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind erosion is minimal to non existent when the site is in a vegetated condition. Significant wind erosion would only be present following high-intensity summer thunderstorms, after wildfire, or abnormally high human or herbivore impacts or extended drought or combinations of these disturbances. After rain events, exposed soil surfaces form physical crusts that tend to reduce wind erosion.

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7. **Amount of litter movement (describe size and distance expected to travel):** Evenly distributed across site. Litter movement consists primarily of redistribution of fine litter (herbaceous plant material) in flow patterns for distances of not more than 5 feet. Litter movement over 5 feet may occur after wildfires, or abnormally high human or herbivore impacts or extended drought or combinations of these disturbances. Amounts and size of material moved may increase after high-intensity summer thunderstorms.

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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):** Moderate to high resistance to erosion. Stability class rating at 2 to 3 in interspaces at soil surface. Under plant shrub or grass plant canopy values will be 4 to 5. These values would be the same for surface and subsurface. Values should be at the high range for fine textured soils. Soils with a surface layer of very coarse sand to fine gravel have no potential for stabilization.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Average Soil Organic Matter (SOM) 1 to 3%. Soil is deep. The soils of the site are deep and excessively drained. The surface layer is sand or loamy sand about 4 to 7 inches thick. The underlying layer of sand extends to a depth of 60 inches or more. The soils have rapid permeability. The available water-holding capacity is low. The plant-soil-water-air relationship is fair to good. Because of the surface texture and rapid drying of the surface, is unprotected by plant cover and organic residue, it becomes wind blown and hummocks or dunes are formed around shrubs.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Grasses should be uniformly distributed and runoff from sites is generally low. The growth habit of dominant species (black grama, bush muhly) promotes water interception and infiltration as compared to bunchgrass or shrub sites. Surface runoff is slow and available water holding capacity is high. Diverse grass, forb, shrub functional/structural groups and diverse root structure/patterns reduces raindrop impact slows overland flow providing increased time for infiltration to occur. Extended drought reduces short and mid bunchgrasses causing decreased infiltration and increased runoff. This situation will self correct in 2 to 5 years following disturbance unless a threshold has been crossed.

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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):** None. Compaction layers are present only after surface activities such as livestock grazing and recreational vehicle use during periods when the soil is moist. There are no soil profile features in the top 9 inches of the soil profile that would be mistaken for a management induced soil compaction layer.

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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: Warm season short bunchgrass > Warm season mid bunchgrass > Cool season mid bunchgrass >

    Sub-dominant: Cool season short coarse grasses > minor component: Forbs = Shrubs

    Other:

    Additional: After wildfires the functional/structural dominance changes to the herbaceous components with a slow 10-20 year recovery of the non resprouting shrubs (e.g., mimosa and sumac). Resprouting shrubs tend to increase if fine fuels and fire frequency is not adequate to reduce the resprouting component. High human or herbivore impacts, extended drought, or combinations of these factors tends to increase shrub functional/structural groups at the expense of the

herbaceous groups and biological crust.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Typically minimal. Expect short/mid bunchgrasses mortality/decadence during or following drought. Most of the perennial plants in this community are long lived, especially the perennial forbs and shrubs and trees. After moderate to high intensity wildfires, all of the non-resprouting shrubs would die as would a small percentage of the herbaceous understory species. Extended droughts would tend to cause relatively high mortality in short lived species such as bristle grass. Shrub mortality would be limited to severe with multiple year droughts. Combinations of wildfires and extended droughts would cause even more mortality for several years following the fire than either disturbance functioning by itself would cause.

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14. **Average percent litter cover (%) and depth (in):** After wildfires, high herbivore impacts, extended drought, or combinations of these disturbances, litter cover and depth decreases to none immediately after the disturbance (e.g., fire) and dependent on climate and plant production increases to post-disturbance levels in one to five growing seasons. If invasive grasses (e.g., love grass) dominates the plant community or is a major component of the shrub understory, litter cover can increase to 70-100% and depth can increase to 1-3." This situation contributes to more frequent fire return intervals and significantly fewer opportunities for desirable perennial plant reproduction and biological crust recovery. This would be a WIDE departure from the reference condition.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** (Low Production 249 lbs./ac.) (Average RV Production 519lbs./ac.) (High Production 792 lbs./ac.) After wildfires, high herbivore impacts, extended drought, or combinations of these disturbances, can cause production to be significantly reduced (100-200 lbs per ac. the first growing season following a wildfire) and recover slowly under below average precipitation regimes.

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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:** Love grass, Russian thistle, kochia, and other nonnative annuals may invade following extended disturbance. Fourwing saltbush and shad scale are native to this site but should not dominate. Pinion and Juniper are the greatest threat to dominate this site in the long term after disturbance (primarily following wildfire exclusion but also includes high human or herbivore impacts and extended drought). Pinion and Juniper are most likely to retain dominance if allowed to alter natural fire regime (this alteration may require poor land management combined with years of wet winter-spring; dry summer-fall conditions). Any of these invaded communities represent a departure from the reference state.

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17. **Perennial plant reproductive capability:** All plant species should be capable of reproduction depending on water regime. All plants should be vigorous, healthy and reproductive depending on disturbance (e.g., drought). Plants should have numerous seed heads, vegetative tillers etc. The only limitations are weather-related effects, wildfire, and natural disease that may temporarily reduce reproductive capability.
