USDA Natural Resources
Conservation Service

Ecological site R035XF606AZ
Sandy Loam Upland 13-17" p.z.

Accessed: 05/17/2024

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.

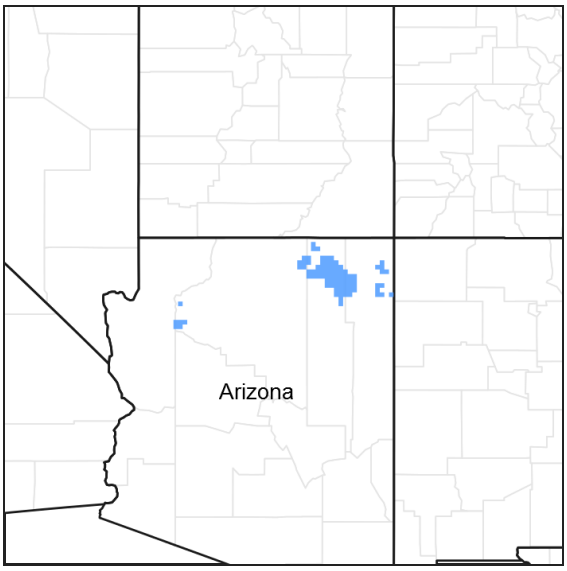

Figure 1. Mapped extent

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.

MLRA notes

Major Land Resource Area (MLRA): 035X–Colorado Plateau

This ecological site occurs in Common Resource Area 35.6 - the Colorado Plateau Pinyon-Juniper-Sagebrush

The Common Resource Area occurs within the Colorado Plateau Physiographic Province. Elevations range from 5800 to 7300 feet and precipitation averages 13 to 17 inches per year. Vegetation includes pinyon, juniper, big sagebrush, cliffrose, Mormon tea, muttongrass, prairie junegrass, squirreltail, western wheatgrass, and blue grama. The soil temperature regime is mesic and the soil moisture regime is aridic ustic. This unit occurs within the Colorado Plateau Physiographic Province and is characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons. Sedimentary rock classes dominate the plateau with volcanic fields occurring for the most part near its margin.

Table 1. Dominant plant species

Tree	(1) *Juniperus osteosperma*
Shrub	(1) *Artemisia tridentata ssp. wyomingensis* (2) *Krascheninnikovia lanata*
Herbaceous	(1) *Hesperostipa comata ssp. comata* (2) *Bouteloua gracilis*

Physiographic features

This site occurs in an upland position. It does not significantly benefit from run-in moisture and does not suffer from excessive runoff. The soils are moderatly deep to very deep with sandy loam surfaces. Slopes generally range from 0 to 15 percent

Table 2. Representative physiographic features

Landforms	(1) Plateau (2) Fan
Flooding frequency	None
Ponding frequency	None
Elevation	1,768–2,225 m
Slope	0–15%
Water table depth	203 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate of this land resource unit is semiarid with warm summers and cool winters. The mean annual precipitation ranges from 13 – 17 inches, but it is very erratic, often varying substantially from year to year. The majority of the precipitation comes from October through April. This precipitation comes as gentle rain or snow from frontal storms coming out of the Pacific Ocean. Snow is common from November through February. Generally no more than a few inches of snow accumulates, melting within a few days, but may last a week or more. The remaining precipitation comes from July through September as spotty, unreliable and sometimes violent thunderstorms. The moisture for this precipitation originates in the Gulf of Mexico (and the Pacific Ocean in the fall) and flows into the area on the north end of the Mexican monsoon. Late May through late June is generally a dry period. The mean annual air temperature ranges from 47 to 49 degrees Fahrenheit (F). The frost-free period (air temperature > 32 degrees F) ranges from 113 to 144 days (@ 50 percent probability). Strong winds are common, especially in the spring.

Table 3. Representative climatic features

Frost-free period (average)	144 days
Freeze-free period (average)	160 days
Precipitation total (average)	432 mm

Influencing water features

The soil moisture on this ecological site comes from precipitation. The site does not benefit significantly from run-on moisture. The sandy loam surface texture of the soil allows the site to capture the majority of both gentle winter storms and intense summer thunderstorms with little runoff.

Soil features

Soils are deep with a very fine sandy loam surface texture and a very fine sandy loam subsoil texture. The soils is formed from residuum and alluvium from sandstone and shale. Geologic formation is quaternary alluvium. Available water capacity is high. Water erosion hazard is high. wind erosion hazard is moderately high. Soils are non-sodic, non-saline with a pH of 7.4-8.4.

Soil survey map unit components correlated to this ecological site include:

SSA-699 Hualapai-Havasupai Area MU 17 Hidvalle;

SSA-711 Navajo Mountain Area MU's Lindrith 2, Plumasano 4 & Aridic Ustorthents 36;

SSA-712 Canyon de Chelly NM MU's 14 Plumasano (family) and 22 Yaggy (family);

SSA-713 Chinle Area MU's 5 Lindrith, 19 Plumasao (family), 40 Plumasano & Royosa, 7 Lindrith.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale
Surface texture	(1) Very fine sandy loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to moderate
Soil depth	102–152 cm
Surface fragment cover <=3"	0–5%
Available water capacity (0-101.6cm)	15.24–25.4 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0%

Ecological dynamics

An ecological site is not a precise assemblage of species for which the proportions are the same from place to place or from year to year. In all plant communities, variability is apparent in productivity and occurrence of individual species. Spatial boundaries of the communities; however, can be recognized by characteristic patterns of species composition, association, and community structure. The historic climax plant community for this ecological site has been described by sampling relict or relatively undisturbed sites and/or reviewing historic records. The historic climax plant community is the plant community that evolved over time with the soil forming process and long term changes in climatic conditions of the area. It is the plant community that was best adapted to the unique combination of environmental factors associated with the site.

Natural disturbances, such as drought, fire, grazing of native fauna, and insects, are inherent in the development and maintenance of these plant communities. The effects of these disturbances are part of the range of characteristics of the ecological site. Fluctuations in plant community structure and function caused by the effects of natural disturbances help establish the boundaries and characteristics of an ecological site. They are accounted for as part of the range of characteristics of the ecological site. Recognizable plant community phases are identified in the reference state of the ecological site. Some sites may have a small range of variation, while others have a large range. Some plant community phases may exist for long periods of time, while others may only occur for a couple of years after a disturbance.

Deterioration of the plant community, hydrology, or soil site stability on an ecological site can result in crossing a threshold or potentially irreversible boundary to another state, or equilibrium. This can occur as a result of the loss of soil surface through erosion, the loss of the stability of the site due to disturbances that cause active erosion on the site, increases in the amounts and/or patterns or runoff from rainstorms, changes in availability of surface and subsurface water, significant changes in plant structural and functional types, or the introduction of non-native

species. When these thresholds are crossed, the potential of the ecological site to return to the historic climax plant community can be lost, or restoration will require significant inputs . There may be multiple states possible for an ecological site, determined by the type and or severity of disturbance.

The known states and transition pathways for this ecological site are described in the state and transition model. Within each state, there may be one or more known plant community phases. These community phases describe the different plant community that can be recognized and mapped across this ecological site. The state and transition model is intended to help land users recognize the current plant community on the ecological site, and the management options for improving the plant community to the desired plant community.

Plant production information in this site description is standardized to the annual production on an air-dry weight basis in near normal rainfall years.

State and transition model

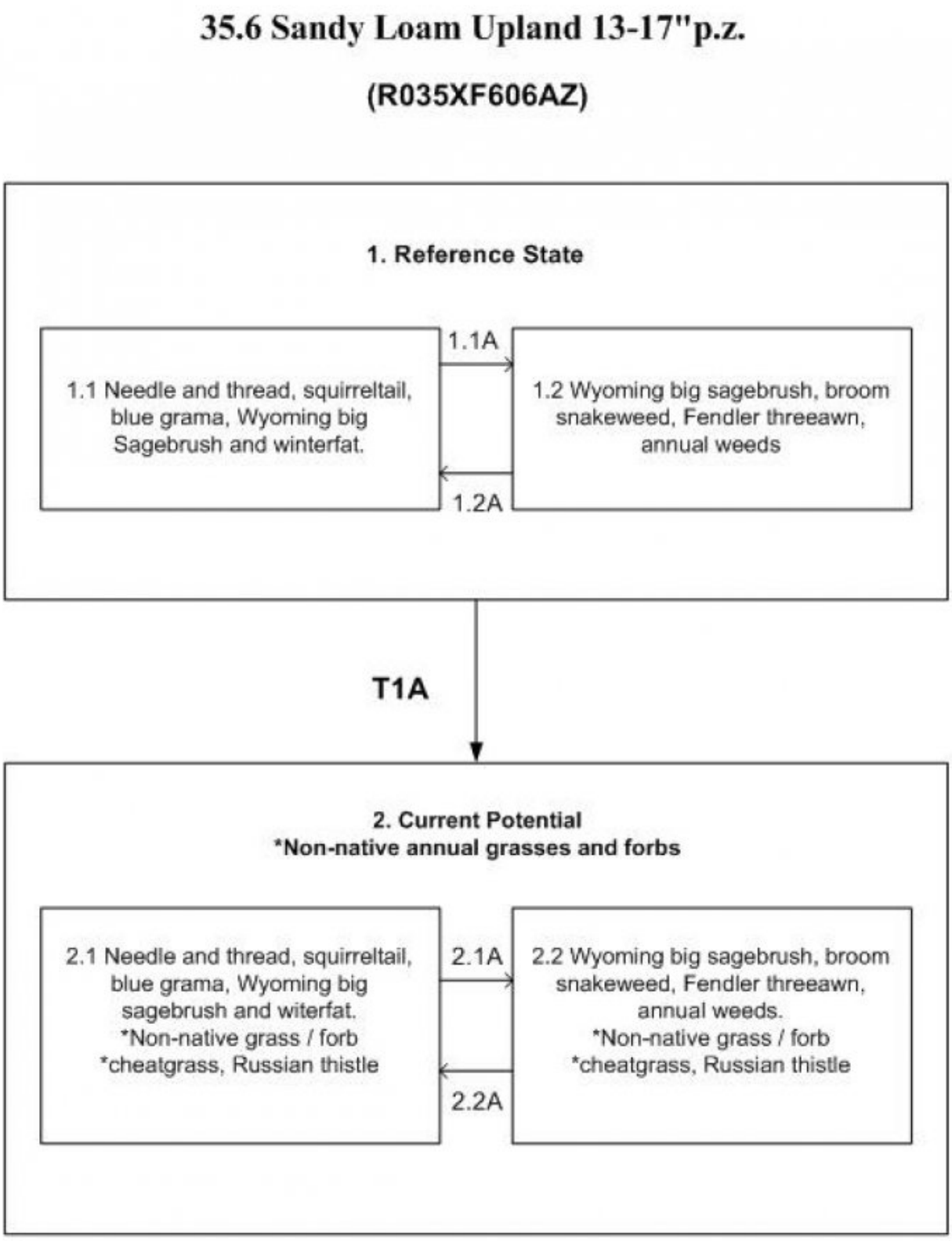

Figure 4. Sandy Loam Upland 13-17"p.z.

State 1
Reference State

The representative plant community for this site is a grass / shrub plant community. Common grasses are needle

and thread, blue grama and squirreltail. The dominant shrubs are Wyoming big sagebrush and winterfat. High levels of grazing reduce grasses and help increase the shrub component.

Community 1.1
Historic Climax Plant Community

Figure 5. Sandy Loam Upland 13-17"p.z.

1.1 Grassland - Shrub Community: Major grasses are needle and thread, blue grama and squirreltail. Major shrubs include winterfat, fourwing saltbush and Wyoming big sagebrush. Grasses are 50-60% of the plant community composition and shrubs are 30-40%. A few forbs are present along with an occasional tree.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	280	420	560
Shrub/Vine	191	280	364
Forb	6	22	34
Tree	–	6	17
Total	**477**	**728**	**975**

Table 6. Ground cover

Tree foliar cover	0-2%
Shrub/vine/liana foliar cover	5-10%
Grass/grasslike foliar cover	5-10%
Forb foliar cover	0-1%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	1-5%	0-1%
>0.15 <= 0.3	–	–	5-10%	–
>0.3 <= 0.6	–	5-10%	–	–
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	0-2%	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 7. Plant community growth curve (percent production by month). AZ3506, 35.6 13-17" p.z. blue grama. Growth occurs mostly in summer and early fall during the rainy season..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	10	15	25	30	15	0	0	0

Figure 8. Plant community growth curve (percent production by month). AZ3516, 35.6 13-17" p.z. bottlebrush squirreltail. Early spring growth; goes semi-dormant in summer; some green up in fall..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	5	15	35	20	5	5	5	5	5	0	0

Figure 9. Plant community growth curve (percent production by month). AZ3561, 35.6 13-17" p.z. all sites. Growth begins in the spring and continues into the fall..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	16	17	15	15	15	11	5	0	0

Figure 10. Plant community growth curve (percent production by month). AZ3565, 35.6 13-17" p.z. needle and thread. Growth occurs mostly in the spring..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	40	40	5	0	0	5	5	0	0

Figure 11. Plant community growth curve (percent production by month). AZ3603, 35.6 13-17" p.z. Wyoming big sagebrush. Most growth occurs in the summer. Seed set occurs in the fall..

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

Figure 12. Plant community growth curve (percent production by month). AZ3925, 35.6 13-17" p.z. winterfat. Growth begins in the spring and continues through the summer. Seed stalk extension and seed set occurs in summer..

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

Community 1.2
Increased Shrubs

1.2 High levels of grazing have diminished the most palatible perennial grass component. Wyoming big sagebrush and broom snakeweed have increased and shrubs are now the dominant plants. Less palatible Fendler threeawn has increased, too.

Pathway 1.1A
Community 1.1 to 1.2

Drought, extended periods of winter dominated moisture, reduction in normal fire frequency, and unmanaged grazing will reduce the perennial grasses on the site and allow the woody species to increase.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing.

State 2
Natives / Introduced Annuals State

The most common non-native plant species on this site is cheatgrass. There can be the reference plant community with a trace of cheatgrass. Also, with a large amount of disturbance the cheatgrass(>5%) can begin to have a significant impact on the biological and hydrological function on this site.

Community 2.1
Introduced Non-Native Plants

Non-native plants have been introduced into the reference plant community 1.1. The most common and invasive on this site is cheatgrass. NOTE: Once non-native plants are introduced into the plant community, it is very difficult to almost impossible to eliminate these plants from the site. Therefore, this becomes an issue of management of the non-native understory plant species.

Community 2.2
Increased Shrubs and Introduced Non-Native Plants

The disturbance has been great enough to allow Wyoming big sagebrush and snakeweed to increase. Less palatible grasses and annuals increase, also. Cheatgrass is the most common non-native plant species to invade the site. NOTE: Once non-native plants are introduced into the plant community, it is very difficult to almost impossible to eliminate these plants from the site. Therefore, this becomes an issue of management of the non-native understory plant species.

Pathway 2.1A
Community 2.1 to 2.2

Continuous disturbance.

Pathway 2.2A
Community 2.2 to 2.1

Grazing management and possible brush treatment.

Transition T1A
State 1 to 2

Introduction of non-native plants.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Grasses**			280–560	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	141–280	–
	blue grama	BOGR2	*Bouteloua gracilis*	141–211	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	69–141	–
	black grama	BOER4	*Bouteloua eriopoda*	0–69	–
	Grass, perennial	2GP	*Grass, perennial*	13–69	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	13–69	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	13–69	–
	Fendler's threeawn	ARPUF	*Aristida purpurea var. fendleriana*	0–29	–
Forb					
2	**Forbs**			6–34	
	Forb, perennial	2FP	*Forb, perennial*	7–21	–
	Forb, annual	2FA	*Forb, annual*	0–15	–
	rose heath	CHER2	*Chaetopappa ericoides*	0–7	–
Shrub/Vine					
3	**Shrubs**			191–364	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	69–141	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	69–141	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	13–69	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	13–69	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	13–69	–
	pale desert-thorn	LYPA	*Lycium pallidum*	0–29	–
Tree					
4	**Trees**			0–17	
	Utah juniper	JUOS	*Juniperus osteosperma*	0–17	–

Animal community

This site is favorable for grazing throughout most of the year by all classes of livestock except when snow cover restricts availability of forage. Planned grazing systems adapt well to this site. Suitability for seeding is fair.

Site has a hazard of wind and water erosion especially when the plant cover is disturbed.

Site supports a vegetative community that is important habitat for Mule deer and winter grazing area for elk and wild turkey.

When cutting for firewood avoid trees with nests.

Recreational uses

Site is typically on draws of undulating plateaus and stream terraces.

Winters are cold, however, relatively mild spring, fall and summer months are attractive to recreationists.

Activities include hunting, cross-country riding, photography, hiking, and wildlife observation.

Wood products

Firewood is available in small quantities and in certain areas.

Type locality

Location 1: Coconino County, AZ	
Township/Range/Section	T26N R9W S11
General legal description	Robbers Roost Canyon Quad: in the Hidden Valley area Sections 11 and 14, T26N, R9W; Hualapai Indian Reservation, Arizona.

Other references

Updates and revisions for this ESD were conducted as part of a 2007-2012 Interagency Technical Assistance Agreement between the Bureau of Indian Affairs–Navajo Region and the NRCS-Arizona.

Contributors

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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)	Kevin Williams
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Date	10/24/2006
Approved by	S. Cassady
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** A few minor rills may form on steeper slopes due to the hig hazard of water erosion.

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2. **Presence of water flow patterns:** A few water flow paterns may form due to the high hazard of water erosion for this site. These would be expected to be short and discontinuous due to the high potential for vegetative ground cover. These soils are moderately well drained and have moderately slow to moderate permeability.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals may form in and adjacent to water flow patterns.

A few terracettes may form due to high hazard for water erosion. These soils are moderately well drained to well drained and have moderately slow to moderate permeability.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground ranges from 10-30%. This site has the potential to produce a moderate to heavy amount of plant cover and litter due to an available water capacity that ranges 6-10 inches. Drought may cause an increase in bare ground.

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5. **Number of gullies and erosion associated with gullies:** None

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Some wind scoured areas, blowouts, and/or depositional areas may occur, especially during drought, due to the moderately high win erosion hazard. High wind erosion hazard occurs on the soils with a surface texture of loamy sand or sandy loam.

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7. **Amount of litter movement (describe size and distance expected to travel):** Herbaceous and fine woody litter will be transported some appreciable distance by wind and in water flow pathways. Coarse woody litter will remain under shrub and tree canopies.

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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):** Soil textures are fine to very fine sandy loams. When well vegetated, these soils have a moderateto high resistance to water erosion, but only a low resistance to wind erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is moderate to strong fine granular. The thickness of the A-horizon is 2-10 inches. The color of the A-horizon is slightly darker than the subsurface soil horizons below it.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** This site is characterized by a distribution of grasses, shrubs and forbs, listed in decending order of occurrence. There may be some trees scattered sparsely across the site. Canopy cover ranges from 60-80% (grasses > shrubs > trees > forbs). Basal cover ranges from 5-10% (grasses > forbs) for vascular plants and 5-10% for biological crust (moss > cyanobacteria > lichen). Both canopy and basal cover values decrease during a prolonged drought. This type of plant communty is moderately effective at capturing and storing precipitation.

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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. Most of the soils are not easily compacted. Many of the soils have a naturally granular structure.

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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: none >

Sub-dominant: perennial bunchgrasses > perennial colonizing grasses > shrubs > annual forbs = perennial forbs = succulents > annual grasses > trees

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** All plant functional groups are adapted to survival in all but the most severe droughts. Severe winter droughts affect trees and shrubs the most. Severe summer drought affects grasses the most.

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14. **Average percent litter cover (%) and depth (in):** Of the total litter amount, it would be expected that approximately 60-80% would be herbaceous litter and approximately 20-40% would be woody litter. Litter amounts increase during the first few years of drought and decrease in later years.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 300-500 lbs/ac dry years; 500-700 lbs/ac median years; 700-900 lbs/ac wet years.

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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:** Broom snakeeed, prickly pear, locoweed, six-weeks grama, and false buffalogass are natives that have the potential to increase and dominate the site after a sagebrush fire and heavy grazing. Cheatgrass is an exotic annual that is becoming endemic to the site regardless of management or fire frequency. It may become dominant after a fire, even with consevative or no grazing. Filaree is an exotic forb that has the potential to invade the site after heavy grazing and/or disturbance, especially if the site is near farm fields or disurbed lands.

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17. **Perennial plant reproductive capability:** All native plants are adapted to the climate and are capable of producing seeds, stolons and/or rhizomes except during the most severe droughts.
