USDA Natural Resources
Conservation Service

Ecological site R035XB230AZ
Sandstone Upland 6-10" p.z. Very Shallow, Warm

Accessed: 05/11/2025

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.

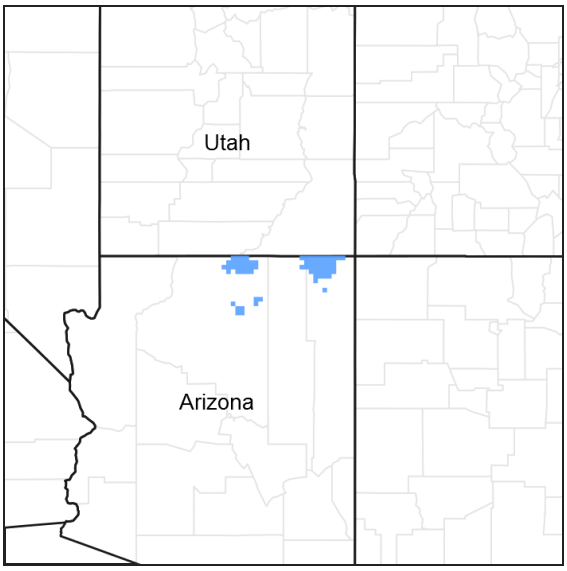


Figure 1. Mapped extent

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.

MLRA notes

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

This ecological site occurs in Common Resource Area 35.2 - the Colorado Plateau Shrub – Grasslands

Elevations range from 3800-5800 feet and precipitation averages 6 to 10 inches per year. Vegetation includes shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. The soil temperature regime is mesic and the soil moisture regime is typic aridic. 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	Not specified
Shrub	(1) *Coleogyne ramosissima*
Herbaceous	(1) *Achnatherum hymenoides*

Physiographic features

This ecolgical site occurs on very shallow soils (<10") over weathered sandstone. Slopes are generally less than 15 percent, but can be higher in spots. The soils are formed from residuum and eolian and alluvial deposits. The site occurs in the lower, warmer elevations and on the warmer slopes of the Common Resource Area that are preferred by blackbrush.

Table 2. Representative physiographic features

Landforms	(1) Structural bench (2) Hill (3) Plateau
Flooding frequency	None
Ponding frequency	None
Elevation	3,800–5,800 ft
Slope	1–15%
Aspect	Aspect is not a significant factor

Climatic features

The 35.2 Colorado Plateau Cold Desert Shrub - Grassland common resource area has a very dry and windy climate that is hot in the summer and cold in the winter. The annual precipitation averages between 6 and 10 inches. The soil moisture regime is typic aridic and the soil temperature regime is mesic. A slight majority of the precipitation arrives during the late fall, winter, and early spring. This winter season moisture originates in the Pacific Ocean and arrives as rain, or sometimes snow, during widespread frontal storms of generally low intensity. The majority of the snow (average range of 1 to 17 inches) falls from December through February, but rarely lasts more than a few days. A seasonal drought occurs from late May through early July. Summer rains occur from July through September during brief intense local thunderstorms. The rain is sporadic in intensity and location. The moisture originates from the Gulf of Mexico in the early summer and the Gulf of California in the late summer/early fall. Windy conditions are common year round, but the winds are strongest and most frequent during the spring.

Table 3. Representative climatic features

Frost-free period (average)	181 days
Freeze-free period (average)	207 days
Precipitation total (average)	10 in

Influencing water features

The soil moisture on this ecological site comes from precipitation. The site does not benefit significantly from run-on moisture. Shallow bedrock areas will concentrate water in deeper soil pockets, where most of the vegetation production occurs. Because of the shallow soils, larger rainfall events will not be entirely captured by the site. This site contributes runoff to other ecological sites.

Soil features

Soil associated with this site are very shallow, soils that formed in eolian and alluvial deposits on hills, sand sheets on structural benches and plateaus. These soils are very shallow to sandstone. The depth is typically 5 to 10 inches deep with occasional small areas of deeper soils.

Typical taxonomic units include:

SSA 707 Little Colorado River Area MU 36 Needle;
SSA 711 Navajo Mountain AZ Mu's 44, 52, 58 & 60 Lithic Torriorthents;;
SSA 717 Shiprock NM - MU's 515 Piute & 520 Needle.

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone
Surface texture	(1) Gravelly fine sandy loam (2) Fine sand (3) Loamy sand
Family particle size	(1) Sandy
Drainage class	Well drained to excessively drained
Permeability class	Moderate to rapid
Soil depth	5–10 in
Surface fragment cover <=3"	5–10%
Available water capacity (0-40in)	0–1 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–35%

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

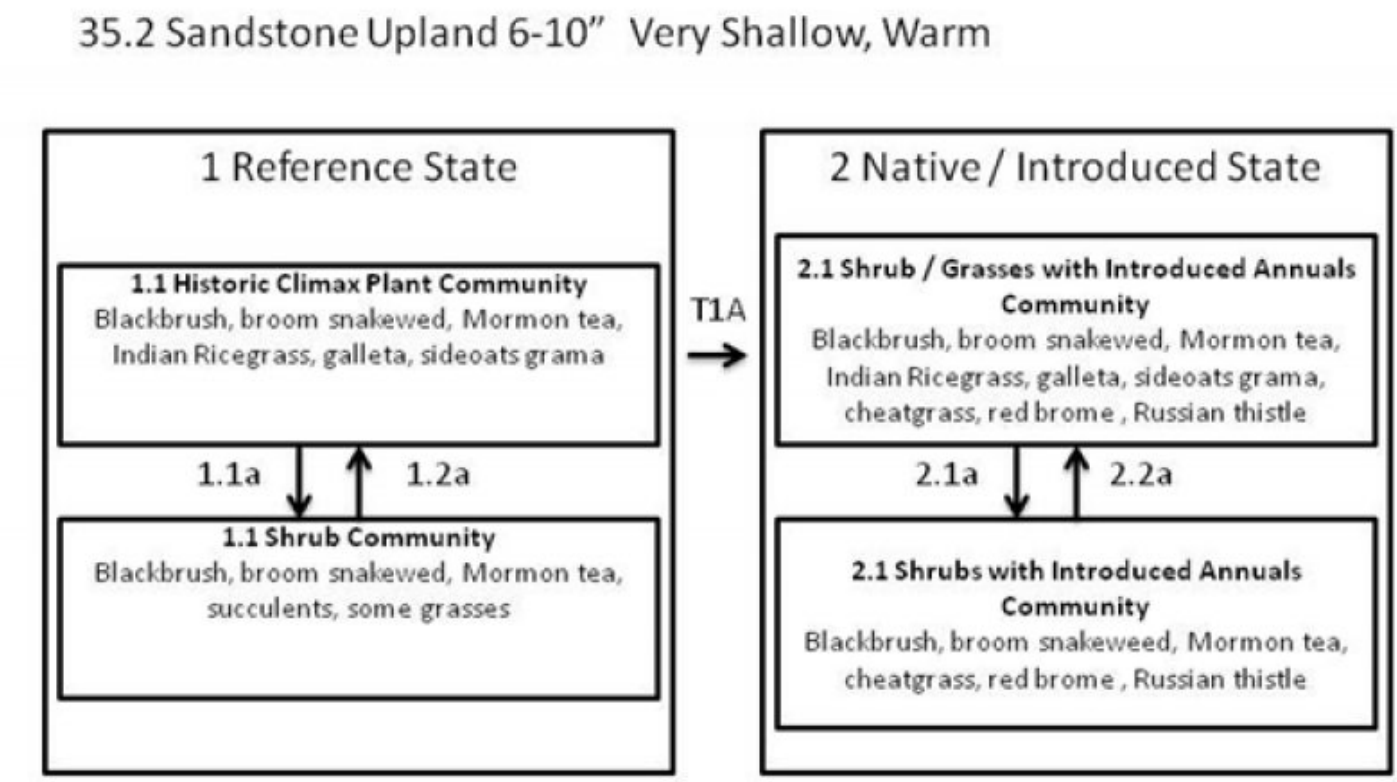


Figure 4. 352 Sandstone Upland Very Shallow Warm S&T

State 1
Reference State

Community 1.1
Historic Climax Plant Community

Figure 5. Sandstone Upland - Very Shallow Site

This ecolgical site site has a plant community made up of primarily of a mix of warm season grasses with a fair percentage of cool season grasses, shrubs. There may be occasional large shrubs/small trees on very shallow sites. There is a mixture of both cool and warm season grasses and half-shrubs. Dominant grasses include blue grama, Indian ricegrass and squirreltail. Dominant shrubs are Apache plume, mormon tea, Bigelow sage and Navajo yucca.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	150	185	225
Grass/Grasslike	60	70	80
Forb	5	10	15
Tree	0	2	10
Total	**215**	**267**	**330**

Table 6. Ground cover

Tree foliar cover	0-3%
Shrub/vine/liana foliar cover	5-17%
Grass/grasslike foliar cover	0-10%
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 (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	0-1%
>0.5 <= 1	–	–	2-10%	–
>1 <= 2	–	5-17%	–	–
>2 <= 4.5	–	–	–	–
>4.5 <= 13	0-3%	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Figure 7. Plant community growth curve (percent production by month). AZ3521, 35.2 6-10" p.z. all sites. Growth begins in the spring and continues through the summer. Most growth in this CRA occurs in the spring using stored winter moisture..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	9	20	27	14	10	11	5	3	0	0

Figure 8. Plant community growth curve (percent production by month). AZ5202, Indian ricegrass, 35.2 6-10" p.z.. Growth begins in spring, most growth occurs in May, goes dormant during summer heat..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	10	15	40	20	0	0	10	5	0	0

Figure 9. Plant community growth curve (percent production by month). AZ5206, 35.2 6-10" p.z. blackbrush. Most growth occurs in the srping, goes dormant during the summer..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	10	20	50	20	0	0	0	0	0	0

Figure 10. Plant community growth curve (percent production by month). AZ5207, 35.2 6-10" p.z. wavyleaf oak. Most growth occurs in the spring and early summer, goes dormant in mid to later summer..

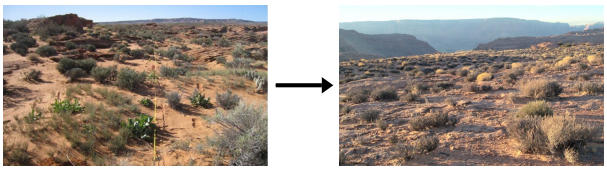
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	10	40	30	10	5	5	0	0	0

Community 1.2
Mixed Shrubs

Figure 11. 1.2 Mixed Shrub Community

This plant community has a mix of shrubs, including the increase of mormon tea, broom snakeweed and succulents. There is also a decline of perennial grasses such as Indian ricegrass.

Pathway 1.1A
Community 1.1 to 1.2



Historic Climax Plant Community

Mixed Shrubs

Drought, extended winter dominated precipitation patterns, interuption of natural fire cycles, and unmanaged livestock grazing will decrease the perennial grasses, which are replaced by shrubs.

Pathway 1.2A
Community 1.2 to 1.1

Mixed Shrubs

Historic Climax Plant Community

Normal precitation patterns with well managed grazing and/or rest will allow native perennial bunchgrasses and other palatable shrubs to increase in the plant community. Allowing natural fires to burn will accelerate recovery.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Introduced Exotic Annuals

Community 2.1
Introduction of Exotic Annuals

Figure 12. 2.1 Natives with Introduced Annuals

This plant community is identical to 1.1 and it includes the introduction of exotic annuals, such as cheatgrass, red brome and Russian thistle in minor amounts.

Community 2.2
Mixed Shrubs w/ Introduced Annuals

This plant community is the same as 1.2 and, once again, there is a smalle component of introduced exotic annuals such as cheatgrass, red brome and Russian thistle. There is probably no practical means of removing the exotic annual grasses from the site once it is introduced, therefore, there is no return pathway suggested in this situation.

Pathway 2.1A
Community 2.1 to 2.2

Continuous heavy herbivory, drought

Pathway 2.2A
Community 2.2 to 2.1

Proper grazing practices and/or rest allow native perennial bunchgrasses and other palatable shrubs to increase in the plant community.

Transition T1A
State 1 to 2

Introduction of non-native annuals species creates an irreversible change in the plant community

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Grasses**			60–80	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	30–40	–
	Grass-like, perennial	2GLP	*Grass-like, perennial*	0–10	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	5–10	–
	James' galleta	PLJA	*Pleuraphis jamesii*	5–10	–
	muttongrass	POFE	*Poa fendleriana*	5–10	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–5	–

	blue grama	BOGR2	*Bouteloua gracilis*	0–5	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–5	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	0–5	–
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	0–5	–
	Fendler's threeawn	ARPUF	*Aristida purpurea var. fendleriana*	0–5	–
Forb					
2	**Forbs**			5–15	
	Forb, annual	2FA	*Forb, annual*	1–5	–
	Forb, perennial	2FP	*Forb, perennial*	1–5	–
	Eastwood's sandwort	AREA	*Arenaria eastwoodiae*	0–5	–
	flatspine stickseed	LAOC3	*Lappula occidentalis*	0–2	–
	shortstem lupine	LUBR2	*Lupinus brevicaulis*	0–2	–
	lemonscent	PEAN	*Pectis angustifolia*	0–2	–
	phacelia	PHACE	*Phacelia*	0–2	–
	little hogweed	POOL	*Portulaca oleracea*	0–2	–
	canaigre dock	RUHY	*Rumex hymenosepalus*	0–2	–
	tall tumblemustard	SIAL2	*Sisymbrium altissimum*	0–2	–
	longbeak streptanthella	STLO4	*Streptanthella longirostris*	0–2	–
Shrub/Vine					
3	**Shrubs**			150–225	
	blackbrush	CORA	*Coleogyne ramosissima*	100–200	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	10–20	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	10–20	–
	Cutler's jointfir	EPCU	*Ephedra cutleri*	5–10	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	5–10	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	5–10	–
		QUPA4	*Quercus ×pauciloba*	5–10	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	5–10	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	1–5	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	1–5	–
	pricklypear	OPUNT	*Opuntia*	1–5	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	1–5	–
	crispleaf buckwheat	ERCOG2	*Eriogonum corymbosum var. glutinosum*	1–5	–
Tree					
4	**Trees**			0–10	
	singleleaf ash	FRAN2	*Fraxinus anomala*	0–10	–
	Utah juniper	JUOS	*Juniperus osteosperma*	0–10	–

Animal community

This site is suitable for grazing during any period of the year by cows and calves, stocker cattle, sheep and horses. Prescribed grazing systems can benefit this site by allowing rest periods for the cool season species.

The potential plant community provides a variety of food and cover plants for wildlife. When the vegetation complex

retrogresses then unpalatable shrub species increase and the site becomes less usable as a foraging area for some species. Grazing practices that encourage cool season grass species are beneficial to antelope, cottontails and rodents. Shrubs that provide both food and cover should be maintained.

Recreational uses

Site is located on gently rolling benches and plateaus which lend themselves to activities such as horseback riding, wildlife observation, photography and hunting.

This site has a variety of spring and summer flowers which are particularly noticeable after good moisture periods. It has good aesthetic appeal when not severely disturbed.

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

Type locality

Location 1: Apache County, AZ	
Township/Range/Section	T40N R26E S4
General legal description	Walker Creek Reservoir Quad - 3 miles southeast of Mexican Water Trading Post; Section4, T40N, R26E, Navajo Indian Reservation, AZ.

Other references

Information and updates collected during 2009-2010 for this ESD was conducted as part of an 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)	Dan Carroll
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Date	03/03/2010
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Except on the steepest slopes, there are no rills associated with this site due to soil textures, rock cover and low precipitation.

2. **Presence of water flow patterns:** Generally, there are no water flow patterns associated with this site. In this lower precipitation site the soil textures are able to accept all the moisture that falls on them.

3. **Number and height of erosional pedestals or terracettes:** None

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** The bare ground for this particular site varies widely between 20-60% depending on the amount of rock present at the site.

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

6. **Extent of wind scoured, blowouts and/or depositional areas:** There can be some deposition (1”-2”)around long lived perennial shrubs and grasses.

7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter is transported by wind and water in open areas that are away from shrubs and trees and under shrubs and trees movement is less. Coarse woody litter tends to stay in place in all areas.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** The soil surface textures are sand, gravelly fine sandy loam, fine sand, sand and loamy sand. The sandy textures at these sites are low to very low soil stability values due to the general lack of structure. Soil stability is 1-2 outside of canopy and 2-3 under canopy.Wind is the major erosion force at this site.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is generally sandy and is single grain; loose and soil organic material is minimal. The A horizon is 2" to 3" in depth and reddish yellow in color. The soil survey for the soil map unit that is being investigated should be referenced to access the unique qualities of that soil.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The canopy cover range is 15-50% (warm season grasses>evergreen shrubs>deciduous shrubs>cool season grasses>forbs>succulents> trees). Basal cover ranges from 18% to 21% (grasses>shrubs). Both of these cover values will decrease during a prolonged drought. This type of plant community is moderately effective at capturing and storing precipitation. The available water capacity is low at 0 to1 inches. The average fetch between perennial plants varies from 5-15 inches and once again, this is dependent on the amount of rock cover that is present on the site.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None.

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: Blackbrush

    Sub-dominant: Cool-season perennial grasses > other shrubs > warm-season perennial grasses

    Other: Minor (0-10%): forbs > annual grasses > succulents

    Additional:

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 survive in all years except during the most severe droughts. Severe winter droughts affect shrubs, trees and cool season grasses the most. Severe summer droughts affect warm season grasses the most.

14. **Average percent litter cover (%) and depth (in):** The litter cover will be varied with different conditions at the site (inter-spaces between plants as opposed to under canopy). Litter amounts increase in the first years of drought and decrease in the later years of a drought.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Average annual production on this site is expected to be 200 to 225 lbs/ac in a year of average annual precipitation.

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 snakeweed, Cutler's jointfir and wavy leaf oak are all native to the site but have the potential to increase on degraded sites. Russian thistle, cheatgrass, and red brome are non-native species that can invade.

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