

Ecological site R035XB215AZ Sandstone/Shale Upland 6-10" p.z.

Accessed: 05/06/2024

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.

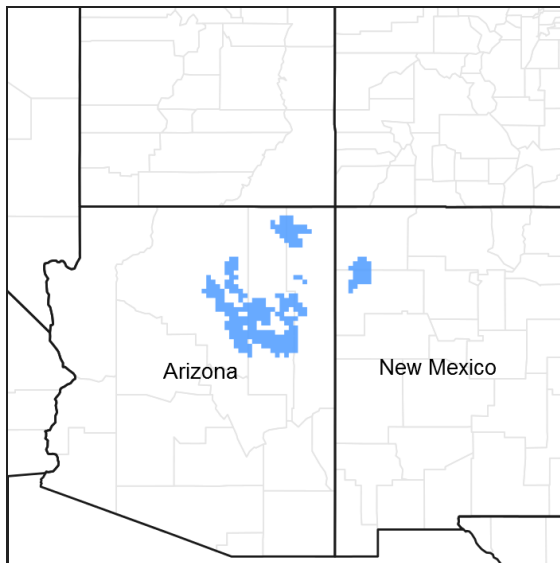


Figure 1. Mapped extent

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 35.2 - 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) <i>Atriplex confertifolia</i> (2) <i>Artemisia bigelovii</i>
Herbaceous	(1) <i>Bouteloua eriopoda</i> (2) <i>Pleuraphis jamesii</i>

Physiographic features

This range site occurs in an upland position on plateaus, mesas or buttes. It is on gently sloping to rolling plains and slopes that are generally 1 - 15% and occasionally up to 30%. It does not benefit from run-in moisture from adjacent areas nor does it suffer from excessive loss of moisture from runoff.

Table 2. Representative physiographic features

Landforms	(1) Plateau (2) Butte (3) Mesa
Flooding duration	Extremely brief (0.1 to 4 hours)
Flooding frequency	None to rare
Ponding duration	Very brief (4 to 48 hours)
Ponding frequency	None to rare
Elevation	1,158–1,768 m
Slope	1–15%
Aspect	Aspect is not a significant factor

Climatic features

About 50% of annual precipitation is received as rain from July to September with the least amounts falling during May and June. Most of the moisture that comes from November to February comes as snow. High winds are common during the winter and spring.

Table 3. Representative climatic features

Frost-free period (average)	181 days
Freeze-free period (average)	207 days
Precipitation total (average)	254 mm

Influencing water features

The site does not benefit from run-in moisture from adjacent areas nor does it suffer from excessive loss of moisture from runoff.

Soil features

Soils on this site are very shallow and shallow (5 - 20 inches deep) to bedrock. The surface textures range from loamy sand to loam about 1 - 4 inches thick. The surface may be covered with up to 20-30% gravels or channers. The subsurface horizon has textures of sandy loam or loam and contains less than 35% gravel by volume. Shallow depth to bedrock restricts the root growth and moisture. The soil has very low available water capacity.

Typical taxonomic units include:

SSA 631 Coconino County Central - MU's 17 Epikom very Cindery Loamy Sand, 18 Epikom Fine Sandy Loam, 18 Epikom gravelly fine Sandy Loam, 63 Epikom;
SSA 633 Navajo County Central - MU's 17, 18, 54 Epikom;
SSA 707 Little Colorado River Area MU's 8 Epikom, 50 Needle and 58 Leupp;
SSA 711 Navajo Mountain MU 9 Lithic Torriorthents;
SSA 713 Chinle Area MU 17 Lithic Torriorthents;
SSA 714 Hopi - MU 7 Epikom;
SSA 715 Fort Defiance Area, Parts of Apache and Navajo Counties, Arizona, and McKinley and San Juan Counties,

New Mexico MU's 34 Farb, 62 Moenkopie, 70 Kimnoli, 108 Farb and 112 Moenkopie;
SSA 717 Shiprock NM - MU 504 Kimnoli.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone (2) Residuum–shale
Surface texture	(1) Loamy sand (2) Sandy loam (3) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderate to moderately rapid
Soil depth	13–51 cm
Surface fragment cover <=3"	1–20%
Surface fragment cover >3"	0–20%
Available water capacity (0-101.6cm)	0–6.35 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Soil reaction (1:1 water) (0-101.6cm)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	5–35%

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

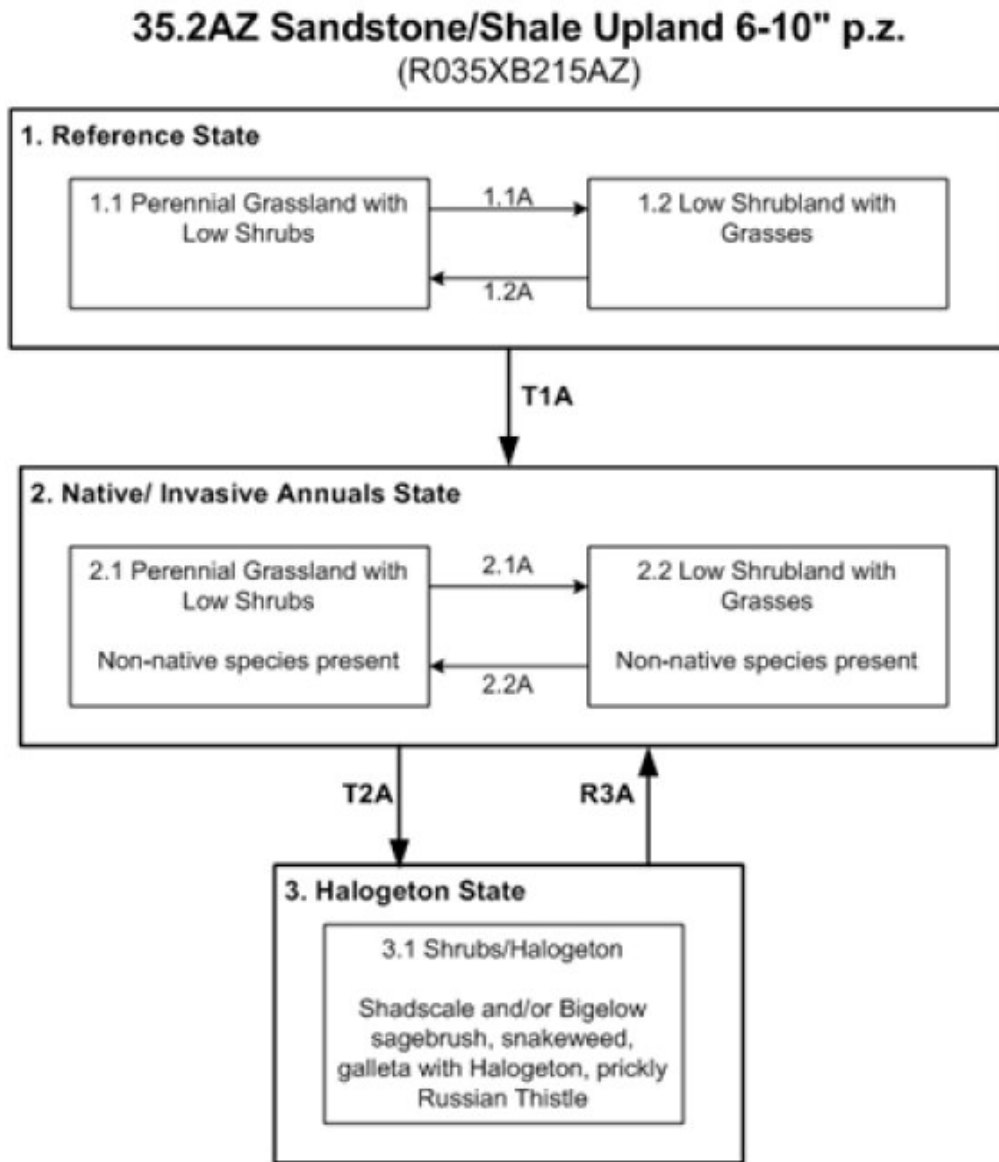


Figure 4. State and Transition Model - R035XB215AZ

**State 1
Reference State**

The reference state and the reference (climax) plant community has been determined by study of relict areas or areas protected from excessive disturbances. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures and historical accounts have also been used. This reference state is characterized as a native mid and short grassland dominated by black grama and galleta with shrubs like Bigelow sagebrush and shadscale saltbush. Sites dominated by sandstone will show a slight dominance of Bigelow sagebrush and sites dominated by shale will show a slight dominance of shadscale. Plant species most likely to

invade or increase on this site when it deteriorates are broom snakeweed, Russian thistle and cacti. Unmanaged grazing during the winter and spring periods will decrease the cool season grasses, which are replaced by lower forage value grasses and shrubs.

Community 1.1 Perennial Grassland with Low Shrubs



Figure 5. Sandstone/Shale Upland 6-10" p.z.

This site has a plant community made up primarily of short and mid grasses with a moderate amount of shrubs. The plant community has a mixture of both cool and warm season plants.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	213	297	404
Shrub/Vine	50	67	95
Forb	17	28	45
Total	280	392	544

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	10-20%
Surface fragments >0.25" and <=3"	1-20%
Surface fragments >3"	0-15%
Bedrock	0%
Water	0%
Bare ground	20-40%

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). AZ5201, 35.2 6-10" p.z. galleta. Growth begins in spring, most growth occurs during summer rains..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	20	10	15	35	5	0	0	0

Figure 9. 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 10. Plant community growth curve (percent production by month). AZ5211, 35.2 6-10" p.z. fourwing saltbush. Growth begins in spring and continues through the summer. Seed stalk extension occurs in summer with seed set in the fall..

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

Community 1.2 Low Shrubland with Perennial Grasses

This plant community is characterized by an increase of shrubs with a decrease in perennial grasses.

Pathway 1.1a Community 1.1 to 1.2

Unmanaged grazing, drought

Pathway 1.2a Community 1.2 to 1.1

Prescribed grazing, favorable climate/moisture.

State 2 Native/ Invasive Annuals State

This plant community state closely resembles the reference state plant community, but introduced annuals, such as cheatgrass and Russian thistle are present in amounts up to 15% composition.

Community 2.1 Perennial Grassland with Low Shrubs - Invasive Annuals

This site has a plant community made up primarily of short and mid grasses with a moderate amount of shrubs and introduced annuals. Annuals such as cheatgrass and Russian thistle are present in minor amounts, 1-15% composition.

Community 2.2 Low Shrubs with Perennial Grasses - Invasive Annuals

This plant community is characterized by an increase of shrubs with a decrease in perennial grasses. Introduced annuals, such as cheatgrass and Russian thistle can make up to 15% composition.

Pathway 2.1a
Community 2.1 to 2.2

Unmanaged grazing, drought.

Pathway 2.2a
Community 2.2 to 2.1

Prescribed grazing, favorable climate/moisture.

State 3
Halogeton State

This plant community is characterized as a shrubland with an invasion of halogeton. Common species in this plant community are Shadscale, Bigelow sagebrush, snakeweed, galleta, Russian Thistle and halogeton.

Community 3.1
Shrubs with Halogeton Invasion

This plant community is characterized by an invasion of halogeton. Common species in this plant community are Shadscale, Bigelow sagebrush, snakeweed, galleta, prickly Russian Thistle with halogeton.

Transition T1A
State 1 to 2

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

Transition T2A
State 2 to 3

Disturbed soil surface, improper grazing, reduced perennial plant cover, seed source for halogeton introduction and establishment.

Restoration pathway R3A
State 3 to 2

Herbicide treatment and prescribed grazing for halogeton control.

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					
0	Dominant Warm Season Grasses			112–202	
	black grama	BOER4	<i>Bouteloua eriopoda</i>	78–118	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	39–84	–
	Forb, annual	2FA	<i>Forb, annual</i>	0–11	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–11	–
	globemallow	SPHAE	<i>Sphaeralcea</i>	0–11	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0–11	–
	spurge	EUPHO	<i>Euphorbia</i>	0–4	–
	ragwort	SENEC	<i>Senecio</i>	0–4	–

	Rocky Mountain zinnia	ZIGR	<i>Zinnia grandiflora</i>	0-4	-
	milkvetch	ASTRA	<i>Astragalus</i>	0-4	-
	cryptantha	CRYPT	<i>Cryptantha</i>	0-4	-
1	Common Warm Season Grasses			67-135	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	11-39	-
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	11-39	-
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	6-28	-
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	0-20	-
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	0-20	-
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0-20	-
	mesa dropseed	SPFL2	<i>Sporobolus flexuosus</i>	0-20	-
2	Common Cool Season Grasses			22-73	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	4-20	-
	squirreltail	ELELE	<i>Elymus elymoides</i> ssp. <i>elymoides</i>	0-20	-
	needle and thread	HECOC8	<i>Hesperostipa comata</i> ssp. <i>comata</i>	0-20	-
	New Mexico feathergrass	HENE5	<i>Hesperostipa neomexicana</i>	4-20	-
3	Other Grasses			0-11	
	Grass, annual	2GA	<i>Grass, annual</i>	0-6	-
	threeawn	ARIST	<i>Aristida</i>	0-6	-
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	0-3	-
	ring muhly	MUTO2	<i>Muhlenbergia torreyi</i>	0-3	-
Forb					
4	Forbs			17-45	
	Forb, annual	2FA	<i>Forb, annual</i>	0-6	-
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-6	-
	buckwheat	ERIOG	<i>Eriogonum</i>	0-6	-
	ragwort	SENEC	<i>Senecio</i>	0-6	-
	globemallow	SPHAE	<i>Sphaeralcea</i>	0-6	-
	desert princesplume	STPI	<i>Stanleya pinnata</i>	0-6	-
	Rocky Mountain zinnia	ZIGR	<i>Zinnia grandiflora</i>	0-3	-
	spurge	EUPHO	<i>Euphorbia</i>	0-3	-
	milkvetch	ASTRA	<i>Astragalus</i>	0-3	-
	cryptantha	CRYPT	<i>Cryptantha</i>	0-3	-
Shrub/Vine					
5	Dominant Shrubs			39-84	
	Bigelow sage	ARBI3	<i>Artemisia bigelovii</i>	22-45	-
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	22-45	-
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	17-28	-
	jointfir	EPHED	<i>Ephedra</i>	11-17	-
	ragwort	SENEC	<i>Senecio</i>	1-4	-
	Forb, annual	2FA	<i>Forb, annual</i>	1-3	-
	Forb, perennial	2FP	<i>Forb, perennial</i>	1-3	-

6	Other Shrubs			22–45	
	crispleaf buckwheat	ERCO14	<i>Eriogonum corymbosum</i>	0–9	–
	brickellbush	BRICK	<i>Brickellia</i>	0–9	–
	Greene's rabbitbrush	CHGR6	<i>Chrysothamnus greenei</i>	0–6	–
	pale desert-thorn	LYPA	<i>Lycium pallidum</i>	0–6	–
	Apache plume	FAPA	<i>Fallugia paradoxa</i>	0–6	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–6	–
	Stansbury cliffrose	PUST	<i>Purshia stansburiana</i>	0–6	–
	Subshrub (<.5m)	2SUBS	<i>Subshrub (<.5m)</i>	0–6	–
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0–6	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	0–4	–
	yucca	YUCCA	<i>Yucca</i>	0–4	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–4	–
	pricklypear	OPUNT	<i>Opuntia</i>	0–4	–

Animal community

This site is suitable for yearlong grazing by either cows and calves or stocker cattle. Planned grazing systems can be readily applied on this site. When deteriorated this site may respond slowly to management.

The potential plant community provides a variety of food and cover plants for wildlife. Where sandstone outcrops occur they are important cover areas for various wildlife species such as cottontails, wrens, and reptiles.

Recreational uses

This site is typified by rolling hills and sandstone breaks, usually on mesas or near sandstone outcropping. It has shrubby grasslands on areas with weathered sandstone outcrops. Winters are cold, however, moderate spring, fall and summer temperatures are attractive to recreational users. Site lends itself to activities such as hunting, horseback riding, photography, hiking, rock collecting, and wildlife observation.

Type locality

Location 1: Navajo County, AZ	
General legal description	Typical site is located on the south side of the Little Colorado River due south of Joseph City, AZ. Also on the Arizona Colorado Land Company highway right-of-way (Highway 65) 1/2 mile north of gate to headquarters.

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)	Dean Schlichting and Kenneth Gishi
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Date	10/26/2010
Approved by	Byron Lambeth
Approval date	
Composition (Indicators 10 and 12) based on	Foliar Cover

Indicators

1. **Number and extent of rills:** Very few rills due to loamy surface textures, rock fragments on surface and moderate permeability. Some active rills on steeper slopes and areas adjacent to rock outcrops or exposed areas.

2. **Presence of water flow patterns:** The occurrence of water flow patterns is occasional (<5% cover) on all slopes in the reference state, and are typically less than 3 feet long and stable. As slopes increase (>10%) water flow pattern occurrence (5-10% cover) and length (3-6ft) increases. An increase in water flow patterns is also expected after large disturbance events such as heavy precipitation.

3. **Number and height of erosional pedestals or terracettes:** The occurrence of pedestalling or terracetting in the reference state is infrequent to slight; however some slight pedestalling may occur in waterflow patterns on steeper slopes. Some mounding of 1/2 to 1" may occur around large shrubs.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20 to 40% bare ground depending on rock fragments, biological crust and exposed bedrock cover. This site may have up to 25% rock fragments on surface.

5. **Number of gullies and erosion associated with gullies:** None. however gullies can occur where runoff is concentrated by exposed rock outcrops and steeper slopes.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

7. **Amount of litter movement (describe size and distance expected to travel):** Most herbaceous and fine woody litter will remain in place with some fine litter (<1/4") transported by wind and water movement in flow paths and rills. Most litter will remain under the shrub canopies and at bases of long lived herbaceous plants.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site should have a soil stability rating of 3-4 throughout the site. Surface texture varies from channery/gravelly fine sandy loam to clay loams.
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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface horizon is 2-5 inches deep. Structure is weak medium platy and weak fine granular. Color is reddish brown (5YR4/3). The A horizon would be expected to be more strongly developed under plant canopies than in the interspaces.
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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 short and mid-grass distribution with moderate amounts of shrubs and a few forbs. Perennial bunch grasses and shrubs provide the majority of plant composition. These plants are found where there are shallow soil deposits or sandstone bedrock cracks that will secure roots and hold moisture on site.
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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.
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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 sod-forming grasses > Cool season bunch grass > evergreen shrubs
- Sub-dominant: warm season bunch grasses > deciduous shrubs
- Other: forbs > Succulents & Cacti
- Additional:
-
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** In a normal year up to 10 to 15% of grasses and shrubs die off. During and after drought years there can be from 10 to 30% die off of shrubs and grasses. Severe winter droughts affect shrubs, trees and cool season grasses the most. Severe summer droughts affect the warm season grasses the most.
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14. **Average percent litter cover (%) and depth (in):** Within plant interspaces litter ranges from 0 to 10% cover with no real depth, while under some shrub and tree canopies it ranges from 30 to 70% cover with depths from 1/8 to 1/2 inch thick.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 250 lbs/ac unfavorable precipitation, 350 lbs/ac normal precipitation, 550 lbs/ac favorable precipitation
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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: Plant species most likely to invade or increase are broom snakeweed, Mormon tea, Russian thistle and halogeton.

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