USDA Natural Resources Conservation Service

Ecological site R035XY122UT
Desert Shallow Loam (Shadscale)

Accessed: 05/19/2024

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.

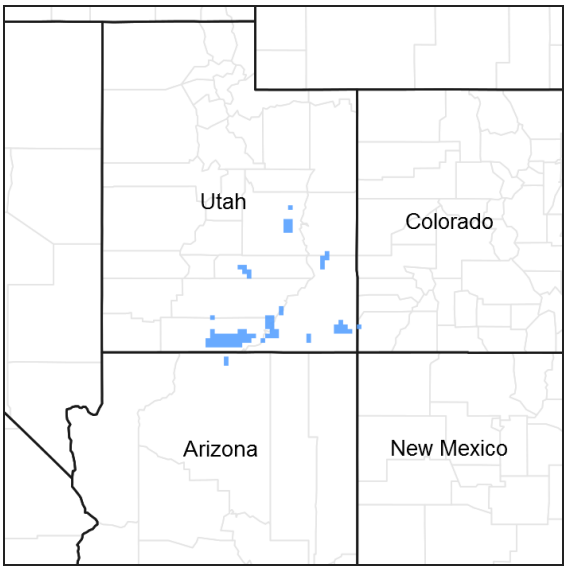

Figure 1. Mapped extent

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

Site Concept: This site developed on shallow, loamy soils in the desert zone of the Colorado and Green River Plateaus region of southern Utah (MLRA 35). It is found on escarpments and structural benches at elevations between 4,000 and 5,600 feet. Annual precipitation ranges from 7 to 10 inches, with about 40% occuring as convective thunderstorms from July through October. The soil moisture regime is aridic and the soil temperature regime is mesic. The plant community is dominated by shadscale, Torrey's jointfir, and/or corymbose buckwheat, with James' galleta as the most common understory grass species. The reference plant community is resistant to change due to a harsh soil environment, the inability to carry fire, and the grazing resistance of shadscale.

Classification relationships

Modal Soil: Casmos Family — loamy, mixed (calcareous), mesic Lithic Torriorthents

Type Location: Consult the Kane County Soil Survey

Associated sites

R035XY109UT	**Desert Loam (Shadscale)**

R035XY124UT	**Desert Shallow Clay (Mat Saltbush)**
R035XY130UT	**Desert Shallow Sandy Loam (Shadscale)**
R035XY133UT	**Desert Shallow Sandy Loam (Blackbrush)**
R035XY139UT	**Desert Stony Loam (Blackbrush)**
R035XY260UT	**Semidesert Very Steep Stony Loam (Salina Wildrye)**

Similar sites

R034BY121UT	**Desert Shallow Loam (Shadscale)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex confertifolia*
Herbaceous	(1) *Pleuraphis jamesii*

Physiographic features

This site mostly occurs on escarpments and associated ledges on escarpments, but can also occur on hillslopes and structural benches. Elevations range from 4000 to 5600 feet. This site most often occurs on slopes greater than 30%, but can also be found on more gentle slopes as long as the soils are shallow.

Table 2. Representative physiographic features

Landforms	(1) Escarpment (2) Structural bench (3) Ledge
Flooding frequency	None
Ponding frequency	None
Elevation	1,219–1,707 m
Slope	15–80%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is charcterized by hot summers and cool winters. Mean annual precipitation ranges from 7 to 10 inches, with about 40% of the moisture coming as convective thunderstorms from July through October. May and June are the driest months, and August is usually the wettest.

This section was developed using modeled climate data (PRISM) based on 30 year normals for soil map units correlated to this ecological site.

Table 3. Representative climatic features

Frost-free period (average)	190 days
Freeze-free period (average)	230 days
Precipitation total (average)	254 mm

Influencing water features

Due to its landscape position, this site is not typically influenced by streams or wetlands. Ephemeral washes may

cross this site, but these washes olny carry water during intense storms. As a result, production may increase and composition may differ near washes, but they do not support riparian-obligate vegetation.

Soil features

The soils on this site are shallow to bedrock and well drained. These soils formed in residuum, slope alluvium and colluvium derived from sandstone and shale. Soil textures are typically loamy, but range in texture from clay loams to loamy fine sands. Rock fragments are usually abundant on the soil surface and throughout the soil profile. Sometimes rock fragments are not abundant. Water holding capacity ranges from 0.4 to 1.6 inches of water in the upper 20 inches of soil. The soil moisture regime is aridic and the soil temperature regime is mesic.

This site has been correlated to soils in the following soil surveys:

UT623 - Emery Area - Pennell, Poncho, Tsaya;
UT633 - Canyonlands Area - Hoskinnini;
UT642 - Kane County - Tsaya, Lithic Torriorthents;
UT685 - Capitol Reef - Simel;
UT686 - Esclalante Grand Staircase - Casmos, Crotoncanyon, Pennell, Tsaya;
UT689 - Glenn Canyon - Pennell, Epikom family;

Table 4. Representative soil features

Parent material	(1) Slope alluvium–sandstone and shale (2) Residuum–calcareous sandstone (3) Colluvium–limestone and sandstone
Surface texture	(1) Very bouldery loam (2) Gravelly clay loam (3) Sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	10–51 cm
Surface fragment cover <=3"	10–30%
Surface fragment cover >3"	15–50%
Available water capacity (0-101.6cm)	1.02–4.06 cm
Calcium carbonate equivalent (0-101.6cm)	1–5%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	15–50%
Subsurface fragment volume >3" (Depth not specified)	0–40%

Ecological dynamics

This site developed under Colorado Plateau ecological conditions and the natural influences of herbivory and climate. This site’s plant species composition is generally dominated by shadscale, Torrey's tea, Bigelow sage and/or corymobose buckwheat. Indian ricegrass and James' galleta are the most common grasses.

There is no evidence that this site historically burned on a regular basis due to very large and persistent gaps between plants. However, modern disturbances such as recreation and livestock grazing, may result in an opportunity for invasive annuals to enter the system. To this point non-native invasive species have not been documented on this site.

This ecological site has been grazed by domestic livestock since they were first introduced into the area around 1860. It is highly resistant to grazing due to the low palatability of shadscale and the lack of forage plants. The introduction of domestic livestock and the use of fencing and reliable water sources have therefore only minimally influenced the historic disturbance regime associated with this ecological site.

The following State and Transition diagram shows the reference plant community. No other plant communities have been documented on this site to date. As more data are collected, new plant communities or states may be added. This model was developed using range data collected over the last 40 years in MLRA D35 in southeastern Utah. Both ocular and measured data was collected and utilized.

State and transition model

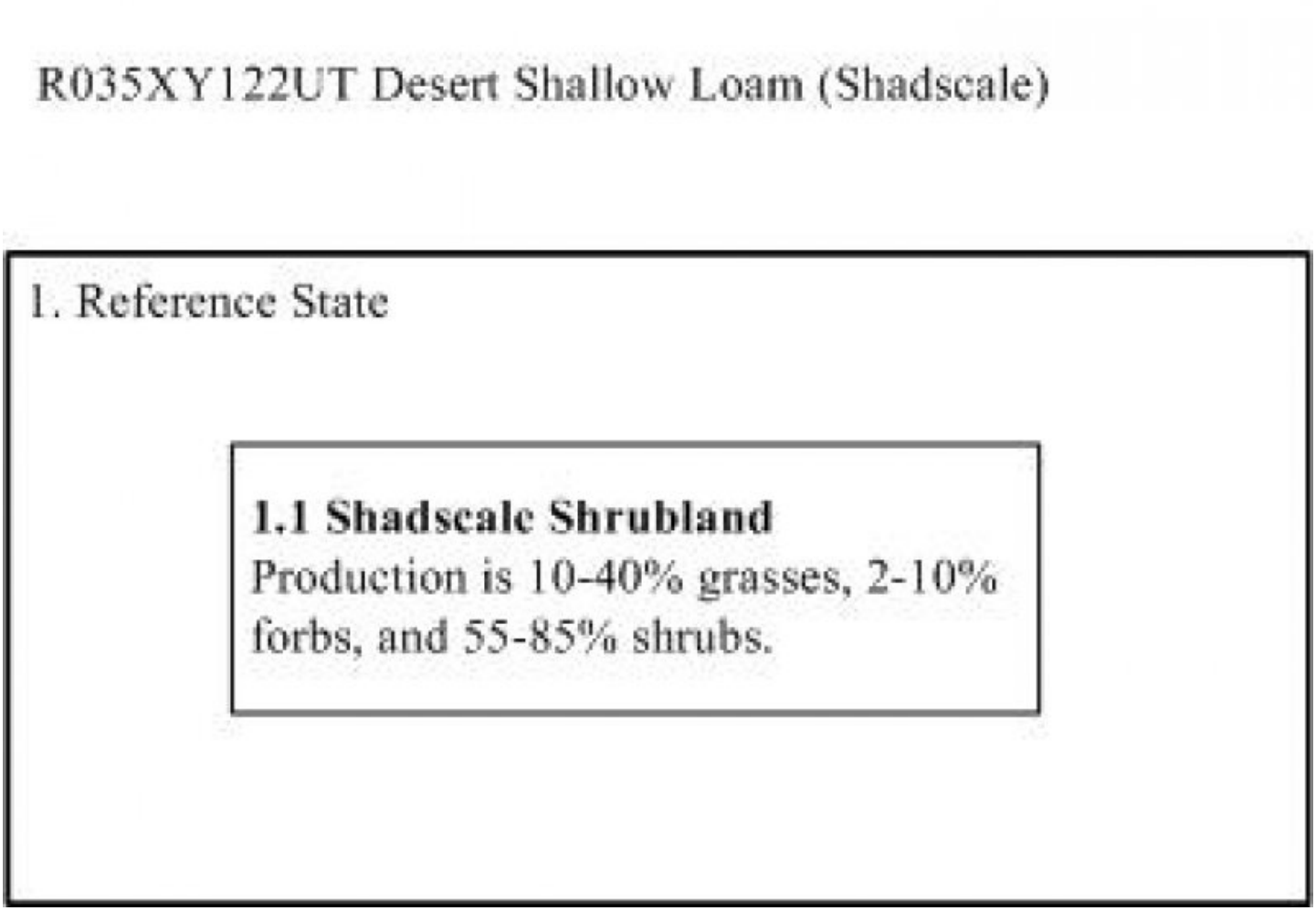

Figure 4. State and Transition Model

State 1
Reference State

The reference state is highly resistant to change due to the harsh soil environment of this site. Few species can readily establish and dominate on a shallow, often salt-affected soil with only 7-10 inches of annual precipitaion. The fuel loads are too sparse to carry a fire, and insect or disease impacts have not been documented to have a major impact on the plant community of the site. The resulting condition is a reference state that perpetuates itself on the site indefinately under natural historical conditions. To this point, no non-native invasive species have been documented on this site, however, it is expected that cheatgrass, Russian thistle, and/or annual mustards may be

able to establish as a result of disturbance.

Community 1.1
Shadscale Shrubland

Figure 5. Phase 1.1

This plant community often consists of diverse shrubs, with shadscale being the most common. Torrey's jointfir, Bigelow sage and corymbose buckwheat may also be very abundant. Forbs are typically sparse and common grasses are Indian ricegrass and James' galleta. Composition by air-dry weight is 10-40% grasses, 2-10% forbs, and 55-85% shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	56	112	168
Grass/Grasslike	6	34	84
Forb	6	11	17
Total	**68**	**157**	**269**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-15%
Grass/grasslike foliar cover	0-5%
Forb foliar cover	0-3%
Non-vascular plants	0%
Biological crusts	0%
Litter	0-6%
Surface fragments >0.25" and <=3"	10-30%
Surface fragments >3"	15-50%
Bedrock	0%
Water	0%
Bare ground	55-75%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-2%	0-2%	0-2%
>0.15 <= 0.3	–	0-5%	0-5%	0-3%
>0.3 <= 0.6	–	5-10%	0-2%	0-1%
>0.6 <= 1.4	–	0-2%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			56–168	
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	6–84	1–6
	shadscale saltbush	ATCO	*Atriplex confertifolia*	11–56	1–4
	James' galleta	PLJA	*Pleuraphis jamesii*	38–56	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	6–50	1–3
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	26–43	–
	needle and thread	HECO26	*Hesperostipa comata*	8–15	–
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	8–15	–
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	2–9	–
3	**Sub-Dominant Shrubs**			6–45	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–17	0–1
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–17	0–1
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–11	0–1
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–11	0–1
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–6	0–1
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	0–6	0–1
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–6	0–1
	threadleaf snakeweed	GUMI	*Gutierrezia microcephala*	0–6	0–1
Grass/Grasslike					
1	**Grasses**			6–84	
	James' galleta	PLJA	*Pleuraphis jamesii*	0–28	0–2
	Grass, annual	2GA	*Grass, annual*	0–17	0–1
	Grass, perennial	2GP	*Grass, perennial*	0–17	0–1
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–17	0–1
	purple threeawn	ARPU9	*Aristida purpurea*	0–11	0–1
	blue grama	BOGR2	*Bouteloua gracilis*	0–11	0–1

	squirreltail	ELEL5	*Elymus elymoides*	0–11	0–1
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–11	0–1
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–6	0–1
Forb					
2	**Forbs**			6–17	
	Forb, perennial	2FP	*Forb, perennial*	0–17	0–1
	Forb, annual	2FA	*Forb, annual*	0–11	0–1
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	0–11	0–1
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	0–11	0–1
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	0–6	0–1
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–6	0–1
	Rocky Mountain beeplant	CLSE	*Cleome serrulata*	0–6	0–1
	redroot buckwheat	ERRA3	*Eriogonum racemosum*	0–6	0–1
	Utah fleabane	ERUT	*Erigeron utahensis*	0–6	0–1

Animal community

--Livestock and Wildlife Grazing--

This site provides fair/poor grazing conditions for livestock and wildlife during fall, winter, and spring due to low availability of nutritious forage. This site also often lacks natural perennial water sources, which can influence the suitability for livestock and wildlife grazing. Care should be taken to maintain the native perennial grasses and shrubs due to the poor suitability for re-seeding or restoring this site. Reseeding and/or restoration are difficult due to the extreme temperatures and variability in time and amount of precipitation. This site may occur in mule deer, desert bighorn sheep, and pronghorn antelope, habitat; however in many places the populations will be small and have little grazing impact on the site.

The plant community is primarily shrubs with dominant canopy cover being made up of shadscale. This shrub provides good browse for mule deer, domestic sheep, and goats in the winter, spring, and fall. It is a minor component of bighorn sheep and pronghorn antelope diets in the winter. Cattle will only utilize the fruits/seeds due to the spiny nature of the plant. Sub-dominant shrubs include winterfat, fourwing saltbush, and Nevada jointfir, which provide good winter browse for cattle, sheep, goats, mule deer, bighorn sheep, and pronghorn antelope. Grasses include galleta, needleandthread, and Indian ricegrass and provide good grazing conditions for all classes of livestock and wildlife. Forb composition and annual production depends primarily on precipitation amounts and thus is challenging to use in livestock grazing management decisions. However, forb composition should be monitored for species diversity, as well as poisonous or injurious plant communities which may be detrimental to livestock if grazed. Before making specific grazing management recommendations, an onsite evaluation must be made.

--References--

Relative Forage Preference of Plants for Grazing Use by Season: Plants commonly found in Major Land Resource Area D35 --The Colorado Plateau. 2007

Stubbendieck, J., S. L. Hatch, and C. H. Butterfield. 1997. North American range plants. Lincoln, NE: University of Nebraska Press. 501p.

USDA, Forest Service. 2007. Fire effects information: plant species life form. Available at http://www.fs.fed.us/database/feis/plants/index.html. Accessed 7 August 2007.

Hydrological functions

The soil is in hydrologic group d. The hydrologic curve numbers are 80 to 89 depending on the condition of the watershed.

Recreational uses

Recreation activities include hiking and hunting.

Wood products

None

Other information

Suitability for rangeland seeding is very poor because of low annual precipitation, and very low available water capacity. --Poisonous/Toxic Plant Communities--

Toxic plants associated with this site include broom and threadleaf snakeweed. Snakeweeds contains steroids, terpenoids, saponins, and flavones that can cause abortions or reproductive failure in sheep and cattle, however cattle are most susceptible. These toxins are most abundant during active growth and leafing stage. Cattle and sheep will typically only graze broom snakeweed when other forage is unavailable and generally in winter when toxicity levels are at their lowest.

Potentially toxic plants associated with this site include four-wing saltbush and buckwheat species, which may accumulate selenium, but only when growing on selenium enriched soils. These plants, when consumed will cause alkali disease or chronic selenosis, which affects all classes of livestock (excluding goats). Typically animals consuming 5-50 ppm selenium will develop chronic selenosis and animals consuming greater than 50 ppm selenium will develop acute selenosis. Clinical signs include lameness, soughing of the hoof, hair loss, blindness, and aimless wondering. Horses tend to develop what is called a “bob” tail or “roached” main due to breakage of the long hairs.

Russian thistle is an invasive toxic plant, causing nitrate and to a lesser extent oxalate poisoning, which affects all classes of livestock. The buildup of nitrates in these plants is highly dependent upon environmental factors, such as after a rain storm during a drought, cool/cloudy days, and soils high in nitrogen and low in sulfur and phosphorus, all which cause increased nitrate accumulation. Nitrate collects in the stems and can persist throughout the growing season. Clinical signs of nitrate poisoning include drowsiness, weakness, muscular tremors, increased heart and respiratory rates, staggering gait, and death. Conversely, oxalate poisoning causes kidney failure; clinical signs include muscle tremors, tetany, weakness, and depression. Poisoning generally occurs when livestock consume and are not accustomed to grazing oxalate-containing plants. Animals with prior exposure to oxalates have increased numbers of oxalate-degrading rumen microflora and thus are able to degrade the toxin before clinical poisoning can occur.

--Invasive Plant Communities--

Generally as ecological conditions deteriorate and perennial vegetation decreases due to disturbance (fire, over grazing, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses will invade the site. Of particular concern in semi-arid environments are the non-native annual invaders including cheatgrass, Russian thistle, kochia, halogeton, and annual mustards. The presence of these species will depend on soil properties and moisture availability; however, these invaders are highly adaptive and can flourish in many locations. Once established, complete removal is difficult but suppression may be possible. Shadscale ecological sites occur on a wide variety of saline soils and thus invading plants will be tolerant of such conditions.

--Fire Ecology--

The ability for an ecological site to carry fire depends primarily on the present fuel load and plant moisture content—sites with small fuel loads will burn more slowly and less intensely than sites with large fuel loads. Many semi-desert plant communities in the Colorado Plateau may have evolved without the influence of fire. However a year of

exceptionally heavy winter rains can generate fuels by producing heavy stands of annual forbs and grasses. When fires do occur, the effect on the plant community may be extreme due to the harsh environment and slow rate of recovery.

Due to the sparse plant cover and lack of fine fuels on this ecological site, historically shadscale dominated shrub communities were not influenced by fire. Fires were rare and non-existent; however increased presence of exotic annual grasses can greatly alter fire regimes due to the increase in fine fuels. The slow recovery period allows for cheatgrass invasions which can subsequently increase the fire regime. When fire does occur shadscale plants are killed and do not readily recover, except through re-establishment by seeds from adjacent unburned stands. Because shadscale seedlings lack spines, they are highly susceptible to browsing and thus grazing should be excluded for at least two years post fire.

--References--

Knight, A. P. and R. G. Walter. 2001. A guide to plant poisoning of animals in North America. Jackson, WY: Teton NewMedia. 367p.

USDA, Forest Service. 2007. Fire effects information: plant species life form. Available at http://www.fs.fed.us/database/feis/plants/index.html. Accessed 7 August 2007.

Contributors

Jamin Johanson
Susanne Mayne
Tom Simper

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)	Shane A. Green (NRCS), Robert D. Stager (BLM), Dana Truman (NRCS), Paul Curtis (BLM) Randy Beckstrand (BLM)
Contact for lead author	shane.green@ut.usda.gov
Date	09/11/2008
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** A. On more gentle slopes (< 10 %): A few rills occur throughout the site. Rills may be 8 or more feet in length but may become longer as slope increases. Rills are most likely to form below adjacent exposed bedrock or where water flow patterns converge and sufficient water accumulates to cause erosion. Rills will be more apparent immediately following large storm events. B. On steeper slopes (> 10 %): Some rills occur throughout the site. Rills may be 15 or more feet in length but may become longer as slope increases. Rills will be more apparent immediately following large storm events.

2. **Presence of water flow patterns:** Frequent and occur throughout the site. Interspaces between well developed biological soil crusts appear to be depression water storage areas but actually direct the water flow patterns across areas covered with biological soil crust during high intensity precipitation events. Evidence of flow will increase with slope. Water flow patterns are somewhat sinuous and wind around perennial plant bases and rocks. They are long (>20 feet), narrow (<6 inches), and not widely spaced (5-15 feet), and often converge creating drainage networks.

3. **Number and height of erosional pedestals or terracettes:** Minor pedestalling may form at the base of plants as a result of natural wind or water erosion, occurring more frequently near water flow patterns. Exposed roots are very rare. Terracettes are rare and occur behind debris dams in water flow patterns. Well developed biological crusts may appear pedastalled, but this is actually a characteristic of the crust formation.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20 – 50%. (Soil surface is typically covered by up to 60 percent rock or caliche fragments). Ground cover is based on the first raindrop impact, and bare ground is the inverse of ground cover. Ground cover + bare ground = 100%.

5. **Number of gullies and erosion associated with gullies:** Present. May be found where adjacent sites or watersheds provide concentrated flows into the site. Gullies should show only minor signs of active erosion and should be mostly stabilized with perennial vegetation and/or rock fragments. Gullies may show slightly more indication of erosion as slope increases, or as the site occurs adjacent to steep sites or watersheds with concentrated flow patterns. Gullies are limited in depth by the shallow bedrock.

6. **Extent of wind scoured, blowouts and/or depositional areas:** No evidence of wind generated soil movement. Wind caused blowouts and deposition are not expected to be present.

7. **Amount of litter movement (describe size and distance expected to travel):** Some down slope redistribution caused by water. Some fine litter removal may occur in flow patterns with deposition occurring at points of obstruction, especially following major storm events. Litter movement will increase with slope.

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 an soil stability rating of 4 to 5 under plant canopies and a rating of 3 to 4 in the interspaces using the soil stability test kit, depending on soil texture and structure, which can vary widely on this ecological site. Surface texture ranges from gravelly fine sandy loam to channery loam to gravely clay loam. Vegetation cover, litter accumulation, surface rock and biological soil crusts reduce erosion.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface horizon is typically up to 3 inches deep. Structure may be vesicular and from weak thin plating parting to moderate very fine subangular blocky to moderate fine granular. Color varies from light red (2.5YR6/6), to dark reddish brown (2.5YR 3/4) to pale yellow (5Y 7/3) to light yellowish brown (10YR6/4). Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Distribution of vascular plants and biological soil crusts are expected to intercept raindrops reducing splash erosion. Plants and biological soil crusts are usually distributed in sufficient density to slow runoff allowing time for infiltration. Natural erosion would be expected in severe thunder storms or heavy spring runoff. When perennial grasses decrease, reducing ground cover and increasing bare ground, runoff is expected to increase and any associated infiltration reduced.

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. The platy to subangular blocky structure and/or shallowness on this site should not be confused with compaction layers.

---

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: Non-sprouting shrubs (Shadscale)

    Sub-dominant: Warm season perennial grasses (Galleta) = Cool season perennial bunchgrasses (Indian ricegrass) > sprouting shrubs (mormontea) > perennial and annual native forbs (globemallow) > Biological soil crusts

    Other: Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. Siberian wheatgrass, forage kochia, etc.)
    Biological soil crust is variable in its expression where present on this site and is measured as a component of ground cover.
    Forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

    Additional: Factors that contribute to temporal variability include drought, insects, and very infrequent fire. Factors that contribute to spatial variability include soil textures, rock fragment content, slope, and aspect.
    Following a recent disturbance such as drought or insects that remove the woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community. In very rare instances, fire may cause the disturbance. These conditions would reflect a functional community phase within the reference state.

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with near average or above average precipitation, there should be very little recent plant mortality and decadence in either the shrubs or grasses. During severe (multi year) drought, many of the Shadscale plants will die. Some mortality of perennial grass and other shrubs may also occur during severe droughts. There may be partial mortality of individual grasses and shrubs during less severe drought. Shadscale may appear dead during droughts, but is actually in a dormant stage with partial leaf shedding.

---

14. **Average percent litter cover (%) and depth (in):** Mostly shadscale leaves and seed. Litter cover (including under plants) 0-5% nearly all of which should be fine litter. Depth should be 1 leaf thickness in the interspaces and up to ¼" under canopies. Litter cover may increase to 3-10% on some years due to increased production of plants.

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 225-250 #/acre on an average year.

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:** Cheatgrass, Russian thistle, halogeton, and other introduced annual forbs.

17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in most years, except in drought years.