

## **Ecological site R030XD046CA**

### **Fan Skirt**

Last updated: 2/25/2025  
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.

#### **MLRA notes**

Major Land Resource Area (MLRA): 030X–Mojave Basin and Range

The Mojave Desert Major Land Resource Area (MLRA 30) is found in southern California, southern Nevada, the extreme southwest corner of Utah and northwestern Arizona within the Basin and Range Province of the Intermontane Plateaus. The Mojave Desert is a transitional area between hot deserts and cold deserts where close proximity of these desert types exert enough influence on each other to distinguish these desert types from the hot and cold deserts beyond the Mojave. Kottek et. al 2006 defines hot deserts as areas where mean annual air temperatures are above 64 F (18 C) and cold deserts as areas where mean annual air temperatures are below 64 F (18 C). Steep elevation gradients within the Mojave create islands of low elevation hot desert areas surrounded by islands of high elevation cold desert areas.

The Mojave Desert receives less than 10 inches of mean annual precipitation. Mojave Desert low elevation areas are often hyper-arid while high elevation cold deserts are often semi-arid with the majority of the Mojave being an arid climate. Hyperarid areas receive less than 4 inches of mean annual precipitation and semi-arid areas receive more than 8 inches of precipitation (Salem 1989). The western Mojave receives very little precipitation during the summer months while the eastern Mojave experiences some summer monsoonal activity.

In summary, the Mojave is a land of extremes. Elevation gradients contribute to extremely hot and dry summers and cold moist winters where temperature highs and lows can fluctuate greatly between day and night, from day to day and from winter to summer. Precipitation falls more consistently at higher elevations while lower elevations can experience long intervals without any precipitation. Lower elevations also experience a low frequency of precipitation events so that the majority of annual precipitation may come in only a couple precipitation events during the whole year. Hot desert areas influence cold desert areas by increasing the extreme highs and shortening the length of below freezing events. Cold desert areas influence hot desert areas by increasing the extreme lows and increasing the length of below freezing events. Average precipitation and temperature values contribute little understanding to the extremes which govern wildland plant communities across the Mojave.

Hyper-Arid Mojave Land Resource Unit (XD)

#### **LRU notes**

The Mojave Desert is currently divided into 4 Land Resource Units (LRUs). This ecological site is within the Hyper-Arid Mojave LRU, extremely hot and dry low elevation troughs within the Mojave Desert. The Hyper-Arid Mojave LRU is designated by the 'XD' symbol within the ecological site ID. This LRU is found within the Death Valley/Mojave Central Trough, as well as portions of the Mojave exposed to the Salton Sea Trough and the Colorado River Valley. This LRU is essentially equivalent to the Death Valley/Mojave Central Trough, Arid Valleys and Canyonlands, and associated Mojave Sand Dunes and Mojave Playas of EPA Level IV Ecoregions.

Elevations range from -280 to 1650 feet with precipitation is less than 4 inches per year. This LRU is distinguished

by its extremely aridity where a nearly barren landscape is occupied by widely spaced plants. Vegetation includes creosote bush, burrobrush, big galleta grass with many annual species able to quickly take advantage of the few precipitation events which occur in this LRU. Playa species such as Mojave seablite and saltbush species are also common in this LRU.

## Ecological site concept

This ecological site is found within the playa landscape on fan skirts or upper portions of fan skirts which do not experience ponding or high salinity. Soils and associated soil components do not have a gypsic, natric or salic diagnostic subsurface horizon.

The central concept for this ecological site is within the Soil Survey of the Marine Corps Air Ground Combat Center at Twentynine Palms, California (CA699) on the 50% Bristolake component of the 252 - Bristolake-Carrizo association, 0 to 4 percent slopes map unit.

This is a group concept and provisional STM that also covers R030XY133CA.

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	(1) <i>Atriplex polycarpa</i> (2) <i>Larrea tridentata</i>
Herbaceous	Not specified

## Physiographic features

This site occurs on fan skirts or upper portions of fan skirts within the playa landscape, generally below 1650 feet elevation. Slopes range from 0 to 8 percent, but slope gradients of 0 to 4 percent are typical.

**Table 2. Representative physiographic features**

Landforms	(1) Fan skirt
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Rare
Ponding frequency	None
Elevation	1,650 ft
Slope	0–8%
Aspect	Aspect is not a significant factor

## Climatic features

The climate is hyper-arid where average annual precipitation is about 2 to 4 inches. Winters are mild with extreme minimum temperatures often between 20 to 30 degrees F. The very hot and dry summers often experience temperatures above 110 degrees F with average maximum temperatures in August generally above 105 degrees F.

**Table 3. Representative climatic features**

Frost-free period (characteristic range)	250 days
Freeze-free period (characteristic range)	273 days
Precipitation total (characteristic range)	4 in
Frost-free period (actual range)	250 days
Freeze-free period (actual range)	273 days
Precipitation total (actual range)	4 in

Frost-free period (average)	250 days
Freeze-free period (average)	273 days
Precipitation total (average)	4 in

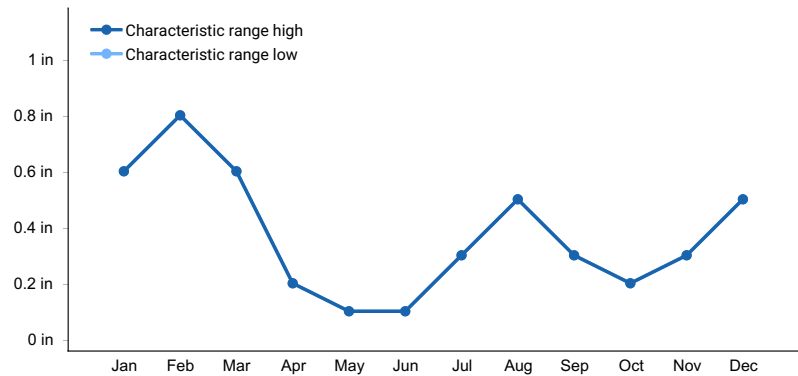


Figure 1. Monthly precipitation range

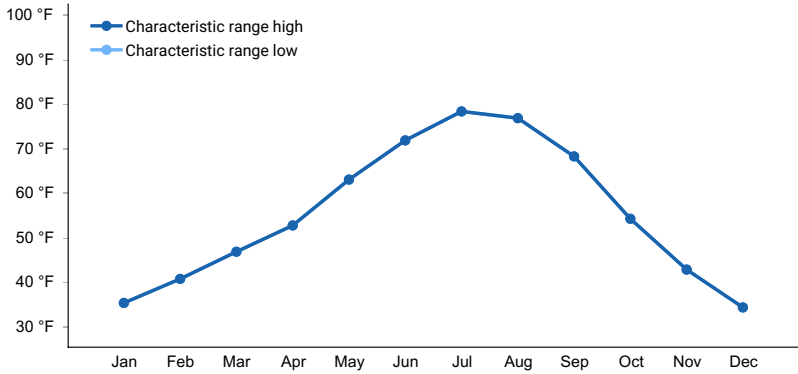


Figure 2. Monthly minimum temperature range

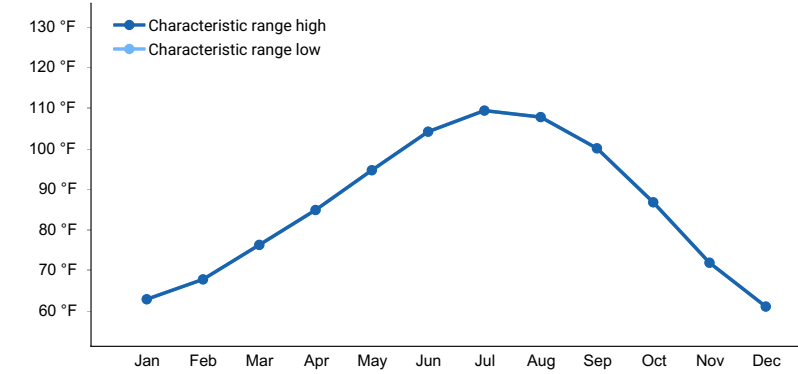


Figure 3. Monthly maximum temperature range

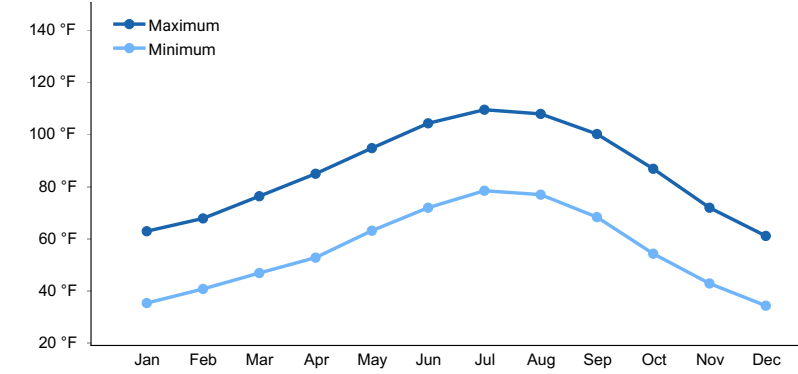


Figure 4. Monthly average minimum and maximum temperature

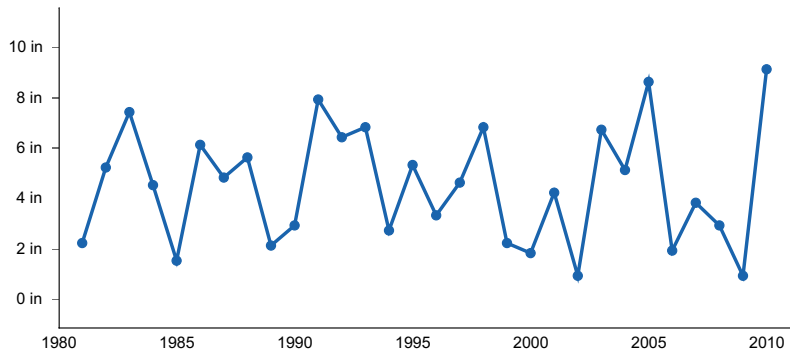


Figure 5. Annual precipitation pattern

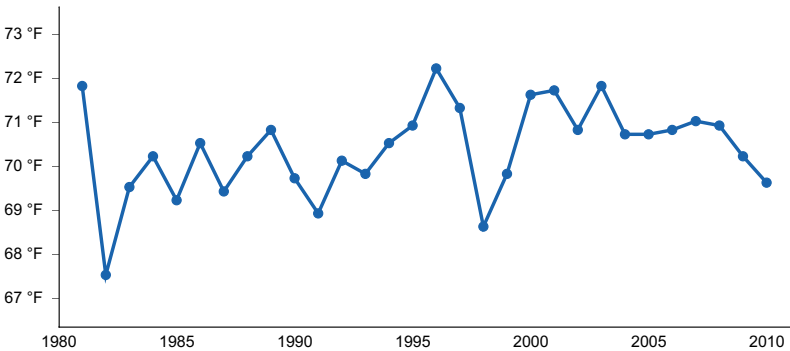


Figure 6. Annual average temperature pattern

### Climate stations used

- (1) BAKER [USC00040436], Baker, CA

### Influencing water features

There are no influencing water features associated with this site.

### Soil features

The soils associated with this site are very deep alluvium derived from mixed igneous sources. Soil reaction is moderately to strongly alkaline.

Table 4. Representative soil features

Surface texture	(1) Sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained
Soil depth	72–84 in
Surface fragment cover <=3"	0–50%
Surface fragment cover >3"	0–2%

### Ecological dynamics

The plant communities of this site are dynamic in response to changes in disturbance regimes and weather patterns. Community phase changes are primarily driven by long term drought. Historically wildfire was infrequent and patchy, due to widely spaced vegetation and low herbaceous production.

Cattle saltbush flowers from May to August, with fruit ripening from October to December. Seeds are dispersed from November to May. Cattle saltbush is tolerant of alkaline conditions and relatively high pH, however,

germination can be reduced if salt concentrations become too high. Large quantities of salt are accumulated in the shoots and on the leaf surface, this is thought to increase its salinity tolerance by reducing the salinity stress of photosynthetically active tissue (Kay et al. 1977).

Cattle saltbush and all *Atriplex* species are well adapted to the Mojave Desert environment. They are examples of extreme drought resistance, surviving more than a week at -6 Megapascals of water potential. The spatial distribution of vegetation of this site impacts runoff, infiltration, sediment redistribution and nutrient cycling. Patches of vegetation increase fine sediment deposition and reduce runoff producing positive feedback dynamics in the plant community. Shrub canopies shield the soil from radiation and rainfall (Puigdefabregas 2005). Shrubs partition the rainfall into interception, throughfall and stem flow. Interception diminishes net rainfall, while stemflow concentrates the water and results in deeper infiltration (Puigdefabregas 2005).

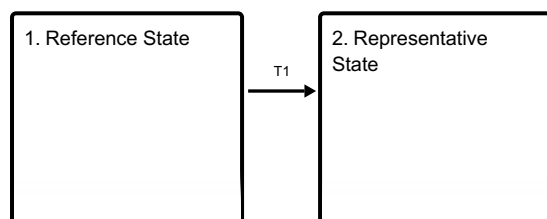
#### Fire Ecology:

The historic mean fire return interval for salt-desert shrub communities ranged from 35 to 100 years. Fires were not historically important in salt-desert shrublands where grasses were not abundant. However, frequent fires fueled by exotic annuals are now common in salt-desert shrublands. Cattle saltbush is most common under regimes of infrequent fire and moderate browsing. Fire top-kills or kills fourwing saltbush, depending upon ecotype. Fourwing saltbush may sprout after top-kill.

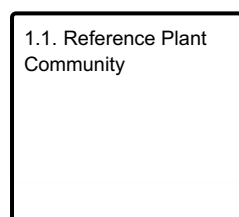
Fire kills many creosotebush. Creosotebush is poorly adapted to fire because of its limited sprouting ability. Creosotebush survives some fires that burn patchily or are of low severity. Indian ricegrass can be killed by fire, depending on severity and season of burn. Indian ricegrass reestablishes on burned sites through seed dispersed from adjacent unburned areas.

## State and transition model

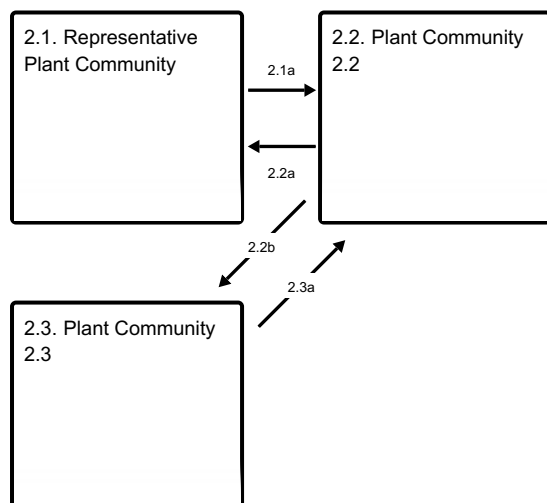
### Ecosystem states



### State 1 submodel, plant communities



### State 2 submodel, plant communities



State 1  
Reference State

The Reference State is representative of the natural range of variability under pristine conditions. The plant community is shrub dominated with few perennial grasses and forbs. Historically, this state experienced an extended fire return interval, which resulted in long-lived stable saltbush plant communities. These communities were sparsely vegetated and soil stability was primarily provided by surface rock fragments and microbiotic soil crust.

Community 1.1  
Reference Plant Community

The representative plant community is dominated by cattle saltbush, white bursage, and creosotebush. Potential vegetative composition is about 10 percent perennial grasses and 10 percent annual and perennial forbs and 80 percent shrubs. Approximate ground cover (basal and crown) is 10 percent. This plant community is representative of a late-seral healthy condition.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	120	240	320
Grass/Grasslike	15	30	40
Forb	15	30	40
Total	150	300	400

State 2  
Representative State

The Representative State is characterized by the presence of non-native annuals in the understory. Introduced annuals such as red brome, Mediterranean grass and redstem filaree have invaded the reference plant community. These non-natives annuals are highly flammable and promote wildfires where fires historically have been infrequent. A biotic threshold has been crossed, with the introduction of non-natives that are difficult to remove from the system and have the potential to significantly alter disturbance regimes from their natural or historic range of variability.

Community 2.1  
Representative Plant Community



Figure 8. Test

This plant community is similar to the reference plant community with a trace of non-natives in the understory. Ecological processes have been not compromised by the presence of non-native species at this time, however, ecological resilience is reduced. Creosotebush and cattle saltbush persist through invasion by non-native annuals,

however, native forbs and grasses are at a competitive disadvantage and suffer reduced vigor and reproductive capacity.

**Community 2.2**  
**Plant Community 2.2**

This plant community is characterized reduced perennial vegetative cover and increased non-native biomass. Ecological resilience is severely reduced. Management should be focused on reducing disturbance and protecting native perennial vegetation to ensure a seed source in the future.

**Community 2.3**  
**Plant Community 2.3**

This plant community is characterized by a short disturbance return interval. The soil surface is continually disturbed decreasing stability and increasing erosion. Non-native annuals take advantage of the increased availability of resources. This plant community is identified as “at risk”. The loss of vegetative cover has reduced the ecological resistance and resilience. A change in management is needed to prevent this plant community from crossing an irreversible threshold.

**Pathway 2.1a**  
**Community 2.1 to 2.2**

Further anthropogenic disturbance removes shrubs and microbiotic soil crust reducing soil stability.

**Pathway 2.2a**  
**Community 2.2 to 2.1**

Changes in management with time, allows woody perennials to recover, contributing to increased ecological resilience.

**Pathway 2.2b**  
**Community 2.2 to 2.3**

Continued disturbance removes cattle saltbush and other shrubby vegetation. Non-native annuals increase.

**Pathway 2.3a**  
**Community 2.3 to 2.2**

Changes in management to remove disturbance and over time the shrubby vegetation will re-establish.

**Transition T1**  
**State 1 to 2**

Introduction of non-native species due to a combination of factors including; surface disturbance, changes in the kinds of animals and their grazing patterns, drought, changes in fire history or any other type of vegetation removal. Non-natives can alter disturbance regimes significantly from their natural or historic range and change ecological processes therefore creating an unlikely scenario to restore the site back to reference.

**Additional community tables**

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Perennial Cool Season Bunchgrass (Mid = 1-3')			4–14	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	2–8	–
	desert needlegrass	ACSP12	<i>Achnatherum speciosum</i>	2–6	–
2	Perennial Warm Season Bunchgrass (Mid 1-3')			2–8	
	threeawn	ARIST	<i>Aristida</i>	2–8	–
3	Perennial Warm Season Bunchgrass (Short < 1')			2–8	
4	Annual			0–9	
Forb					
5	Perennial			6–24	
	desert globemallow	SPAM2	<i>Sphaeralcea ambigua</i>	6–24	–
6	Annual			0–10	
	spineflower	CHOR12	<i>Chorizanthe</i>	1–10	–
	desert trumpet	ERIN4	<i>Eriogonum inflatum</i>	1–10	–
Shrub/Vine					
7	Primary Shrubs			135–300	
	cattle saltbush	ATPO	<i>Atriplex polycarpa</i>	75–135	–
	creosote bush	LATR2	<i>Larrea tridentata</i>	15–60	–
	burrobush	AMDU2	<i>Ambrosia dumosa</i>	30–60	–
8	Secondary Shrubs			15–45	
	jointfir	EPHED	<i>Ephedra</i>	3–15	–
	desert-thorn	LYCIU	<i>Lycium</i>	3–15	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	3–15	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	3–15	–
	desertholly	ATHY	<i>Atriplex hymenelytra</i>	3–15	–

## Animal community

### Livestock Interpretations:

This site is poorly suited to livestock grazing because of low forage production. Grazing management should be keyed to Indian ricegrass and cattle saltbush. Indian ricegrass has good forage value for domestic sheep, cattle and horses. It supplies a source of green feed before most other native grasses have produced much new growth. Cattle saltbush is one of the most palatable shrubs in the West. Its protein, fat, and carbohydrate levels are comparable to alfalfa. It provides nutritious forage for all classes of livestock. Palatability is rated as good for domestic sheep and domestic goats; fair for cattle; fair to good for horses in winter, poor for horses in other seasons.

White bursage is an important browse species. Browsing pressure on white bursage is particularly heavy during years of low precipitation, when production of winter annuals is low. White bursage is of intermediate forage value. It is fair to good forage for horses and fair to poor for cattle and sheep. However, because there is often little other forage where white bursage grows, it is often highly valuable to browsing animals.

Many animals bed in or under creosotebush. Domestic sheep dig shallow beds under creosotebush because it provides the only shade in the desert scrub community. Creosotebush is unpalatable to livestock. Consumption of creosotebush may be fatal to sheep.

Stocking rates vary over time depending upon season of use, climate variations, site, and previous and current management goals. A safe starting stocking rate is an estimated stocking rate that is fine tuned by the client by adaptive management through the year and from year to year.



#### Wildlife Interpretations:

Cattle saltbush provides valuable habitat and year-round browse for wildlife. Cattle saltbush also provides browse and shelter for small mammals. Additionally, the browse provides a source of water for black-tailed jackrabbits in arid environments. Granivorous birds consume the fruits. Wild ungulates, rodent and lagomorphs readily consume all aboveground portions of the plant. White bursage is an important browse species for wildlife.

Many small mammals browse creosotebush or consume its seeds. Desert reptiles and amphibians use creosotebush as a food source and perch site and hibernate or estivate in burrows under creosotebush, avoiding predators and excessive daytime temperatures.

### Hydrological functions

Runoff is negligible to medium and permeability is moderately slow to rapid. Sparse shrub canopy and associated litter break provide some protection from raindrop impact. Water flow patterns are rare to common depending on site location relative to major inflow areas from higher landscape positions.

### Other products

Indian ricegrass was traditionally eaten by some Native American peoples. The Paiutes used seed as a reserve food source.

White bursage is a host for sandfood, a parasitic plant with a sweet, succulent, subterranean flowerstalk. Sandfood was a valuable food supply for Native Americans.

Creosotebush has been highly valued for its medicinal properties by Native Americans. Twigs and leaves may be boiled as tea, steamed, pounded into a powder, pressed into a poultice, or heated into an infusion.

### Other information

Indian ricegrass is well-suited for surface erosion control and desert revegetation although it is not highly effective in controlling sand movement.

White bursage may be used to revegetate disturbed sites in southwestern deserts.

Creosotebush may be used to rehabilitate disturbed environments in southwestern deserts. Once established, creosotebush may improve sites for annuals that grow under its canopy by trapping fine soil, organic matter, and symbiont propagules. It may also increase water infiltration and storage.

### Type locality

Location 1: Nye County, NV	
Township/Range/Section	T17S R52E S7
General legal description	About 2 miles west of Nevada Highway 160, Amargosa Desert, Nye County, Nevada. This site is also found in southern Lincoln and Clark Counties, Nevada.

### Other references

Fire Effects Information System (Online; <http://www.fs.fed.us/database/feis/plants/>).

Kay, B.L., C.R. Brown and W.L. Graves. 1977. Desert Saltbush. Mojave Revegetation Notes. UC Davis. No. 18.

Kottek, M., Grieser, J., Beck, C., Rudolf, B., & Rubel, F. (2006). World map of the Köppen-Geiger climate classification updated. *Meteorologische Zeitschrift*, 15(3), 259-263.

Puigdefabregas, J. 2005. The role of vegetation patterns in structuring runoff and sediment fluxes in drylands. *Earth Surface Processes and Landforms*. 30:133-147.

Salem, B. B. (1989). *Arid zone forestry: a guide for field technicians* (No. 20). Food and Agriculture Organization (FAO).

USDA-NRCS Plants Database (Online; <http://www.plants.usda.gov>).

## Contributors

Dustin Detweiler

## Approval

Sarah Quistberg, 2/25/2025

## 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)	P.Novak-Echenique
Contact for lead author	State Rangeland Management Specialist
Date	10/19/2011
Approved by	Sarah Quistberg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

1. **Number and extent of rills:** None

---

2. **Presence of water flow patterns:** Water flow patterns are rare to common depending on site location relative to major inflow areas from higher landscape positions.

---

3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare with occurrence typically limited to areas within water flow patterns.

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground up to 85%

---

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

---

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

---

7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage from grasses and annual & perennial forbs) expected to move distance of slope length during intense summer convection storms. Persistent litter (large woody material) will remain in place except during large rainfall events.

- 
8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability values should be 1 to 3 on most soil textures found on this site. (To be field tested.)
- 
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Structure of soil surface will be medium platy or massive. Soil surface colors are pale brown or light gray and soils typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is less than 1 percent.
- 
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Sparse shrub canopy and associated litter break provide some protection from raindrop impact.
- 
11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** Compacted layers are none. Massive sub-surface horizons, subsoil calcic horizons are not to be interpreted as compacted 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: Tall shrubs (cattle saltbush & creosotebush)
- Sub-dominant: associated low-statured, shrubs (white bursage, shadscale) >> deep-rooted, cool season, perennial bunchgrasses > perennial forbs = annual forbs > shallow-rooted, perennial bunchgrasses.
- Other: Warm season bunchgrasses
- Additional:
- 
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs common and standing dead shrub canopy material may be as much as 30% of total woody canopy; mature bunchgrasses commonly (<20%) have dead centers.
- 
14. **Average percent litter cover (%) and depth ( in):** Between plant interspaces and under canopy 5-10%, depth 0.25 inches
- 
15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season  $\pm$  300 lbs/ac; favorable 400 lbs/ac, unfavorable 150 lbs/ac
- 
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: Potential invaders include red brome, Mediterranean grass, annual mustards, Russian thistle, and redstem filaree.

---

17. **Perennial plant reproductive capability:** All functional groups should reproduce in average and above average growing season years
-