USDA Natural Resources Conservation Service

Ecological site R029XY186CA
Sandy Slope 10-12" p.z.

Last updated: 2/20/2025
Accessed: 05/13/2025

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): 029X–Southern Nevada Basin and Range

The Southern Nevada Basin and Range MLRA (29) represents the transition from the Mojave Desert to the Great Basin. It is cooler and wetter than the Mojave. It is warmer and typically receives more summer precipitation than the Great Basin. This area is in Nevada (73 percent), California (25 percent), and Utah (2 percent). It makes up about 26,295 square miles (68,140 square kilometers). Numerous national forests occur in the area, including the San Bernardino, Angeles, Sequoia, Inyo, Humboldt-Toiyabe, and Dixie National Forests. Portions of Death Valley National Monument, the Nuclear Regulatory Commission's Nevada Test Site, the Hawthorne Ammunition Depot, and the Nellis Air Force Range in Nevada and the China Lake Naval Weapons Center in California also are in this MLRA. The northeast part of the Paiute Indian Reservation and the southern third of the Walker River Indian Reservation are in the part of this MLRA in Nevada, and the Lone Pine, Fort Independence, and Big Pine Indian Reservations are in the part in California.
Physiography:
The entire area is in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. The area of broad, nearly level, aggraded desert basins and valleys between a series of mountain ranges trending north to south. The basins are bordered by sloping fans and pluvial lake terraces. The mountains are uplifted fault blocks with steep side slopes and not well dissected due to limited annual precipitation. Most of the valleys in this MLRA are closed basins or bolsons containing sinks or playa lakes.
Geology:
The mountains are dominated by Pliocene and Miocene andesite and basalt rocks, Paleozoic and Precambrian carbonate rocks prominent in some areas. Scattered outcrops of older Tertiary intrusives and very young tuffaceous sediments (Pliocene and Miocene) are in the western and eastern thirds of this MLRA. The valleys consist mostly of alluvial fill and playa deposits at the lowest elevations in the closed basins.
Climate:
The average annual precipitation is 3 to 12 inches (75 to 305 millimeters) in most of this area. It may be as high as 29 inches (735 millimeters), on the higher mountain slopes. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. Summers are dry, but sporadic storms are common in July and August.
Water Resources:
Water resources are scarce. Ground water and surface water sources are limited. Streams are small and intermittent. Quality of surface water in naturally degraded as streams cross area of valley fill effected by dissolved salts. Irrigation water may raise the levels of dissolved salts and suspended sediments causing contamination.
Soils:
Dominant soil orders include Entisols and Aridisols.

Ecological site concept

The Sandy Slope 10-12" p.z. Ecological Site is on mountains. It is on backslopes that typically have a north-facing aspect, but may be on slopes with an east-facing aspect. Slopes range from 15 to 60 percent, but are typically between 30 and 60 percent. The soils are formed from colluvium and residuum derived and weathered from granite. Soils are very deep and sandy throughout the profile with no soil development.

Associated sites

F029XY001CA	**Shallow Sandy Slope** This a woodland community found at higher elevations on upper backslopes of mountains. It is typically found on north and east-facing slopes.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. vaseyana* (2) *Eriogonum wrightii*
Herbaceous	(1) *Poa secunda* (2) *Achnatherum speciosum*

Physiographic features

The Sandy Slope 10-12" p.z. Ecological Site is on mountains. It is on backslopes that typically have a north-facing aspect, but may be found on slopes with an east-facing aspect. Slopes range from 15 to 60 percent, but are typically between 30 and 60 percent.

Table 2. Representative physiographic features

Landforms	(1) Mountain
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	792–1,829 m
Slope	15–60%
Water table depth	183 cm
Aspect	N, NE, E

Climatic features

The climate associated with this site is arid, characterized by cool, moist winters and hot, dry summers. Mean annual air temperature is 50 to 56 degrees F. Monthly minimum temperature averages range from 30 to 80 degrees F (-1 to 27 degrees C). Monthly maximum temperature averages range from 60 to 110 degrees F (16 to 43 degrees C) (CSU 2002).

Average annual rainfall is between 2 and 8 inches (50 to 205 millimeters) (USDA 2006). Snowfall is more common at elevations above 4000 feet (1,220 meters), but it may not occur every year (WRCC, 2002).

Spring is typically the windiest season, with winds averaging 10-15 miles per hour (WRCC, 2002). Winds in excess of 25 miles per hour and gusts in excess of 50 miles per hour are not uncommon (CSU, 2002).

Although half of the Jawbone-Butterbredt ACEC Soil Survey is in the Mojave Desert (MLRA 30), the western and northwestern areas of the survey transition into the Southern Nevada Basin and Range (MLRA 29). As the Mojave Desert transitions into the Southern Nevada Basin and Range, the temperature range generally becomes cooler (WRCC, 2002). Precipitation as rain and as snow also increases (USDA, 2006). This survey area has a wide range of precipitation due to its location. Where the Mojave Desert influences are stronger, average annual precipitation ranges from 5 to 7 inches (127 to 178 millimeters). Where the Southern Nevada Basin and Range influences are stronger, average annual precipitation commonly ranges from 7 to 9 inches (178 to 229 millimeters), and may range up to 12 inches (305 millimeters) annually (WRCC 2002). At elevations above 4,000 feet (1,370 meters), average annual snowfall may reach 20 inches (WRCC, 2002).

The data from the following climate stations were used to describe the climate in the Jawbone-Butterbredt ACEC Soil Survey (station number in parentheses):
Inyokern, CA (044278)
Mojave, CA (045756)
Tehachapi, CA (048826)

"Maximum monthly precipitation" represents average monthly precipitation.

Table 3. Representative climatic features

Frost-free period (characteristic range)	166-205 days
Freeze-free period (characteristic range)	204-240 days
Precipitation total (characteristic range)	152-229 mm
Frost-free period (actual range)	154-212 days
Freeze-free period (actual range)	199-254 days
Precipitation total (actual range)	127-279 mm
Frost-free period (average)	185 days
Freeze-free period (average)	223 days
Precipitation total (average)	203 mm

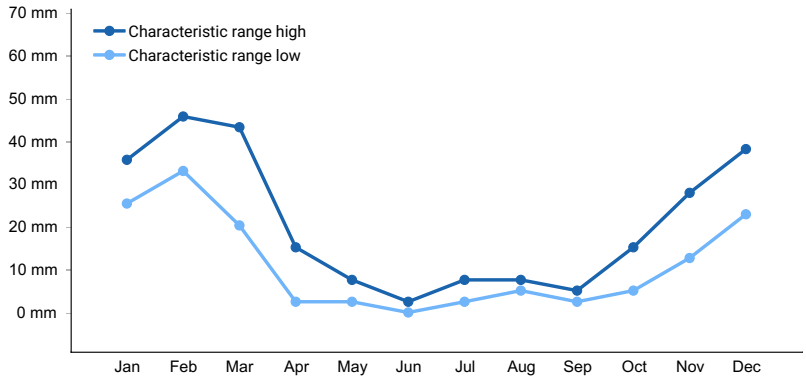


Figure 1. Monthly precipitation range

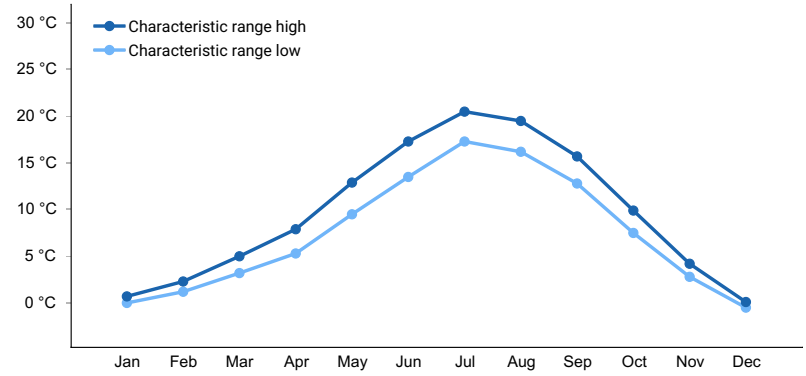


Figure 2. Monthly minimum temperature range

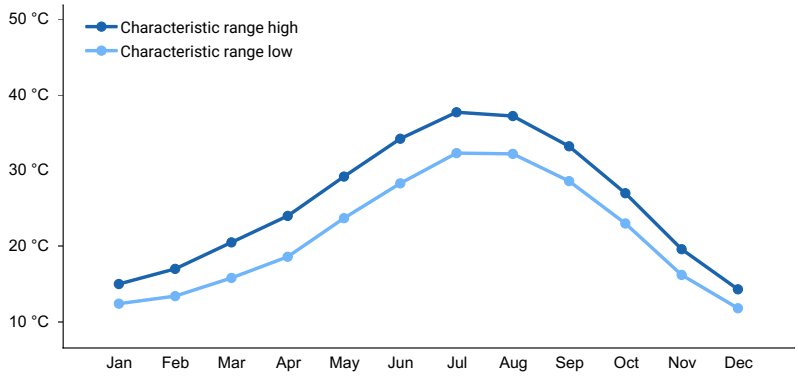


Figure 3. Monthly maximum temperature range

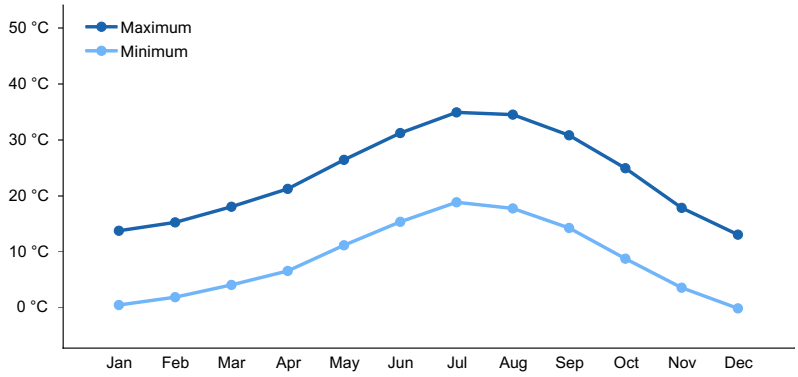


Figure 4. Monthly average minimum and maximum temperature

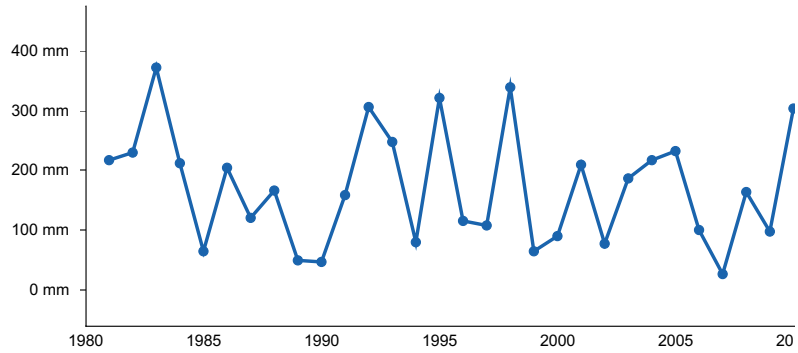


Figure 5. Annual precipitation pattern

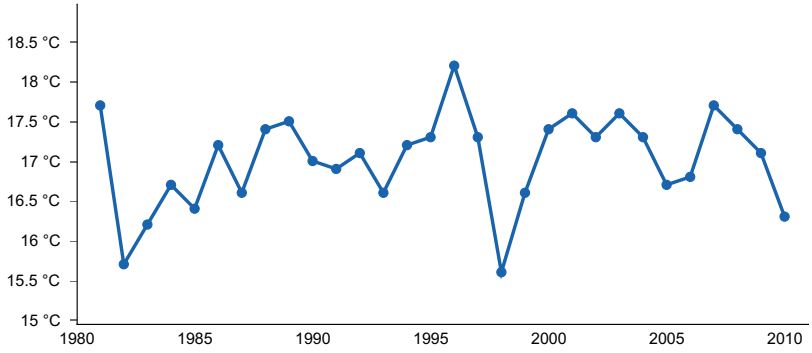


Figure 6. Annual average temperature pattern

Climate stations used

- (1) TEHACHAPI [USC00048826], Tehachapi, CA
- (2) INYOKERN [USC00044278], Inyokern, CA
- (3) MOJAVE [USC00045756], Mojave, CA

Influencing water features

There are no water features associated with this site.

Soil features

The soils are formed from colluvium and residuum derived and weathered from granite. Soils are very deep and sandy throughout the profile with no soil development. They are somewhat excessively drained, and permeability is moderately rapid to rapid. Available water capacity is very low to low. The soils classify as mixed, mesic Xeric Torripsamments.

Soil survey area - Map unit symbol - Component
CA682 - 5205 - Grandora (major)
CA682 - 5210 - Grandora (major)

Table 4. Representative soil features

Parent material	(1) Colluvium–granite (2) Residuum–granite (3) Colluvium–granitoid (4) Residuum–granitoid
Surface texture	(1) Coarse sand (2) Gravelly loamy coarse sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	152 cm
Surface fragment cover <=3"	5–80%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	5.84–12.19 cm
Calcium carbonate equivalent (0-101.6cm)	0–1%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	6.6–7.8
Subsurface fragment volume <=3" (Depth not specified)	5–35%
Subsurface fragment volume >3" (Depth not specified)	0–45%

Ecological dynamics

This ecological site occurs predominantly on north-facing slopes. Relative to adjacent areas, these slopes have cooler temperatures and water is plant available for longer periods of the year. These cooler and wetter conditions provide a favorable growing environment for the dominant species on this ecosite, mountain big sagebrush (*Artemisia tridentata* ssp. vaseyana).

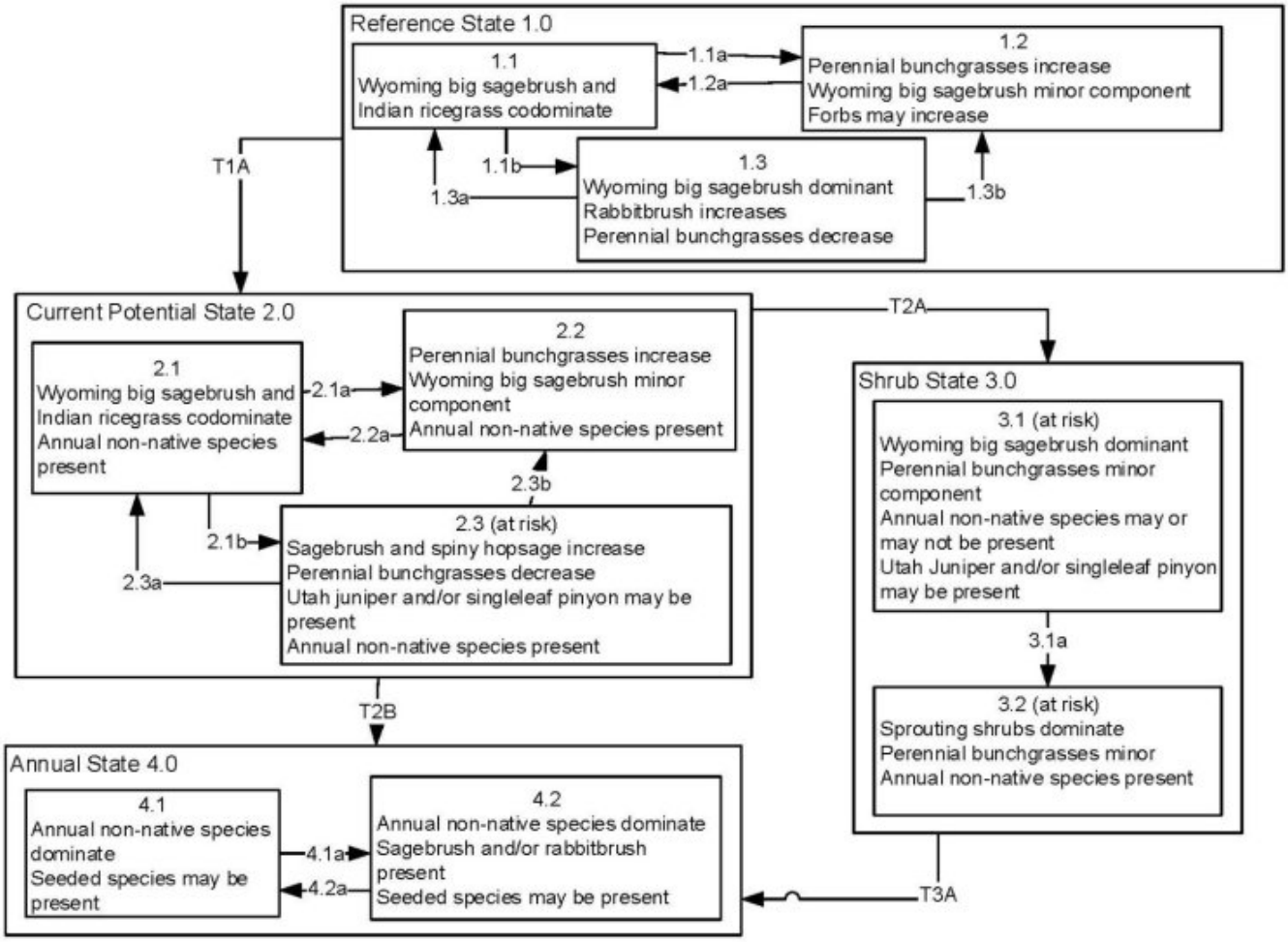
Mountain big sagebrush is a deep-rooted, long-lived, late seral species that is widely distributed in the western U.S (Johnson, 2000). It reproduces by seed, and recruitment of individuals occurs in pulses, but conditions favorable for high recruitment are not well known. Warmer temperatures have promoted germination under simulated spring

germination conditions (Young et al., 1991). Below-average precipitation during the first growing season, possibly associated with warmer temperatures, has also been weakly associated with higher recruitment (Maier et al., 2001). However, based on its relatively low tolerance of heat and drought, more severe conditions of warm temperatures and drought would likely have a negative effect on recruitment.

Sandberg bluegrass (*Poa secunda*) and desert needlegrass (*Achnatherum speciosum*) are major herbaceous species on this ecosite. They persist where there is no or minimal canopy cover, and sagebrush may reduce their presence by shading them out.

Wildfire may significantly impact sagebrush communities. Sagebrush is readily injured or killed by fire, and it does not resprout (Johnson, 2000). Following a fire, dominant species will be those that resprout or easily colonize disturbed areas. These include grasses such as desert needlegrass (*Achnatherum speciosum*) and Sandberg bluegrass (*Poa secunda*), and short-lived shrubs such as buckwheat species (Eriogonum spp.). Mormon tea (*Ephedra viridis*) is often found in late seral stages, but may be present following a fire because it can resprout if not severely burned (Anderson, 2001). Reestablishment of sagebrush by seed may take 15-30 years (Harris, 2006 personal communication; Johnson, 2000). As it grows, sagebrush will shade out or outlive other species. Fire return intervals for this area are approximately 130 to 150 years (Harris, 2006 email communication).

State and transition model


Reference State 1.0
1.1
Wyoming big sagebrush and
Indian ricegrass codominate
1.1a
1.2a
1.2
Perennial bunchgrasses increase
Wyoming big sagebrush minor component
Forbs may increase
T1A
1.1b
1.3a
1.3
Wyoming big sagebrush dominant
Rabbitbrush increases
Perennial bunchgrasses decrease
1.3b
Current Potential State 2.0
T2A
2.1
Wyoming big sagebrush and
Indian ricegrass codominate
Annual non-native species
present
2.1a
2.2a
2.2
Perennial bunchgrasses increase
Wyoming big sagebrush minor
component
Annual non-native species present
2.3b
2.1b
2.3a
2.3 (at risk)
Sagebrush and spiny hopsage increase
Perennial bunchgrasses decrease
Utah juniper and/or singleleaf pinyon may be
present
Annual non-native species present
Shrub State 3.0
3.1 (at risk)
Wyoming big sagebrush dominant
Perennial bunchgrasses minor
component
Annual non-native species may or
may not be present
Utah Juniper and/or singleleaf pinyon
may be present
3.1a
3.2 (at risk)
Sprouting shrubs dominate
Perennial bunchgrasses minor
Annual non-native species present
T2B
Annual State 4.0
4.1
Annual non-native species
dominate
Seeded species may be
present
4.1a
4.2a
4.2
Annual non-native species dominate
Sagebrush and/or rabbitbrush
present
Seeded species may be present
T3A

Reference State 1.0 Community Phase Pathways
1.1a: Low severity fire creates grass/sagebrush mosaic; high severity fire significantly reduces sagebrush cover and leads to early/mid-seral community, dominated by grasses and forbs.
1.1b: Time and lack of disturbance such as fire or drought. Excessive herbivory may also decrease perennial understory.
1.2a: Time and lack of disturbance allows for shrub regeneration.
1.3a: Low severity fire or Aroga moth infestation resulting in a mosaic pattern.
1.3b: High severity fire significantly reduces sagebrush cover leading to early/mid-seral community.

Transition T1A: Introduction of non-native species such as bulbous bluegrass, cheatgrass and thistles.

Current Potential State 2.0 Community Phase Pathways
2.1a: Low severity fire creates grass/sagebrush mosaic; high severity fire significantly reduces sagebrush cover and leads to early/mid-seral community dominated by grasses and forbs; non-native annual species present.
2.1b: Time and lack of disturbance such as fire or drought. Inappropriate grazing management may also reduce perennial understory.
2.2a: Time and lack of disturbance allows for regeneration of sagebrush.
2.3a: Low severity fire or Aroga moth infestation creates sagebrush/grass mosaic. Brush management with minimal soil disturbance; late-fall/winter grazing causing mechanical damage to sagebrush.
2.3b: High severity fire significantly reduces sagebrush cover leading to early mid-seral community.

Transition T2A: Time and lack of disturbance and/or inappropriate grazing management (3.1).
Transition T2B: High severity fire and/or soil disturbance (4.1). Inappropriate grazing that favors shrubs in the presence of non-native annual species (4.2).

Shrub State 3.0 Community Phase Pathways
3.1a: Fire.

Transition T3A: Catastrophic fire and/or soil disturbance (4.1). Inappropriate grazing management in the presence of non-native annual species (4.2).

Annual State 4.0 Community Phase Pathways
4.1a: Time and lack of fire, unlikely to occur.
4.2a: Fire.

State 1
Big sagebrush

Community 1.1

Big sagebrush

Figure 7. Sagebrush

The interpretive plant community is the reference plant community prior to European colonization. This community occurs below the pinyon pine (*Pinus monophylla*) woodland. Sagebrush is the dominant shrub in the community. Wright's buckwheat (*Eriogonum wrightii*), Sandberg bluegrass (*Poa secunda*), and desert needlegrass (*Achnatherum speciosum*) are other important species in this community. Mormon tea (*Ephedra viridis*) is also an important species that occurs in late seral communities. Small amounts of California juniper (*Juniperus californica*) and singleleaf pinyon (*Pinus monophylla*) are present in this ecosite, but their distribution does not suggest encroachment into this ecosite from surrounding areas. The potential plant community of the site is 85 percent shrubs, 10 percent perennial grasses, and 5 percent annual forbs. "Typical Annual Production of Understory Species Under Low, RV, and High Canopy Cover" represents the contribution of each species to total vegetation cover, not production.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	898	1092	1286
Grass/Grasslike	101	123	146
Forb	10	12	15
Tree	–	6	11
Total	**1009**	**1233**	**1458**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	30-35%
Grass/grasslike foliar cover	3-5%
Forb foliar cover	2-3%
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. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	15-20%
Grass/grasslike basal cover	2-3%
Forb basal cover	1-2%
Non-vascular plants	0%
Biological crusts	0%
Litter	1-2%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 8. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	2-3%
>0.15 <= 0.3	–	–	–	–
>0.3 <= 0.6	–	10-15%	3-5%	–
>0.6 <= 1.4	–	20-25%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
1	**Perennial Shrubs**			898–1286	
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	603–695	–
	narrowleaf goldenbush	ERLI6	*Ericameria linearifolia*	76–175	–
	Joshua tree	YUBR	*Yucca brevifolia*	121–175	–
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	56–146	–
	peach thorn	LYCO2	*Lycium cooperi*	20–29	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	10–15	–
	blackbrush	CORA	*Coleogyne ramosissima*	1–15	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–11	–
	California juniper	JUCA7	*Juniperus californica*	0–11	–
Grass/Grasslike					
2	**Perennial Grasses**			101–146	
	Sandberg bluegrass	POSE	*Poa secunda*	61–87	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	20–29	–
	squirreltail	ELEL5	*Elymus elymoides*	20–29	–
Forb					
3	**Perennial Forbs**			10–15	
	tarragon	ARDR4	*Artemisia dracunculus*	10–15	–
Tree					
4	**Trees**			0–11	
	singleleaf pinyon	PIMO	*Pinus monophylla*	0–11	–

Animal community

Sagebrush is an important cover and food source for wildlife. It is valuable winter forage for many species. Sandberg bluegrass and desert needlegrass are also important forage species.

Sagebrush is poor to fair forage for domestic livestock (Sampson and Jesperson, 1963). Grasses are preferred, especially when new growth is present. Livestock use of this ecosite may be limited by steep slopes and few water sources.

Inventory data references

3 Line-point intercept transects (2006)
2 SCS Range 417 Production and Composition Record (2004)

Type locality

Location 1: Kern County, CA	
UTM zone	N
UTM northing	3928632
UTM easting	397009
Latitude	35° 29′ 45″

Longitude	118° 8′ 7″
General legal description	This site is located in the Jawbone-Butterbredt ACEC off SC47 where it crosses the Pacific Crest Trail.

Other references

Anderson, Michelle D. 2001. *Ephedra viridis*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2006, November 30].

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Contributors

Heath M. McAllister

Approval

Kendra Moseley, 2/20/2025

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)	
Contact for lead author	
Date	05/13/2025
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

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

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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

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:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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:**

17. **Perennial plant reproductive capability:**