USDA Natural Resources Conservation Service

Ecological site R029XY185CA
Shallow Granitic Hills 7-9" p.z.

Last updated: 2/20/2025
Accessed: 05/10/2025

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 Shallow Granitic Hills 7-9" p.z. Ecological Site is on hills and may also be on mountains. It is typically on slopes ranging from 8 to 30 percent. The elevation range is about 3,700 to 5,200 feet. The soils on this ecological site are formed from colluvium and residuum derived from granite. Soils are very shallow or shallow to highly weathered bedrock over unweathered bedrock, gravelly, and have sandy loam textures. They contain an argillic horizon above

the weathered bedrock.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Coleogyne ramosissima* (2) *Eriogonum fasciculatum*
Herbaceous	(1) *Poa secunda*

Physiographic features

The Shallow Granitic Hills 7-9" p.z. ecological site is on hills and may also be on mountains. It is typically on slopes ranging from 8 to 30 percent. The elevation range about 3,700 to 5,200 feet.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Rock pediment (3) Mountain
Runoff class	Very high
Flooding frequency	None
Ponding frequency	None
Elevation	3,700–5,200 ft
Slope	8–30%
Water table depth	72 in
Aspect	Aspect is not a significant factor

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 4,000 feet (1,220 meters), but it may not occur every year (WRCC, 2002).

Windy conditions are also common. Spring is typically the windiest season, with winds averaging 10 to 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)	6-9 in
Frost-free period (actual range)	154-212 days
Freeze-free period (actual range)	199-254 days
Precipitation total (actual range)	5-11 in
Frost-free period (average)	185 days
Freeze-free period (average)	223 days
Precipitation total (average)	8 in

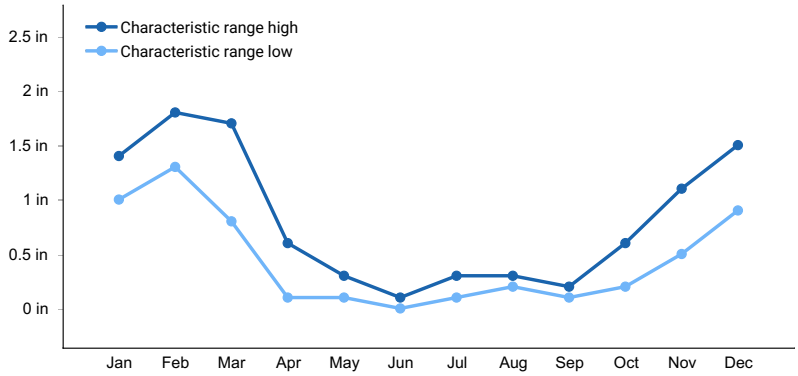


Figure 1. Monthly precipitation range

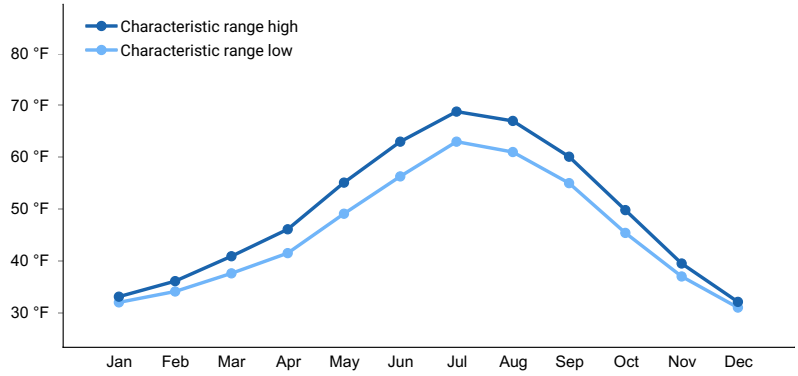


Figure 2. Monthly minimum temperature range

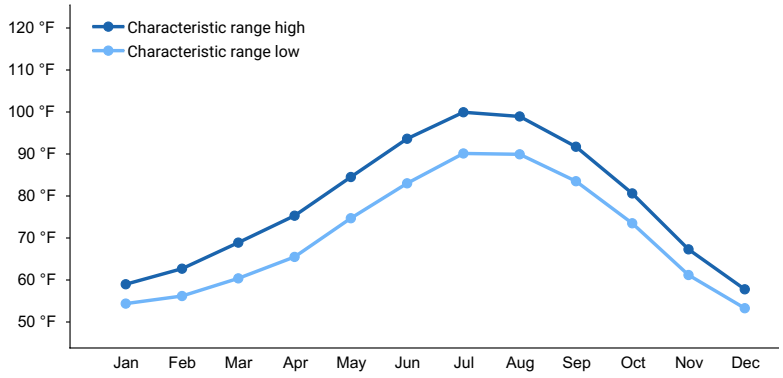


Figure 3. Monthly maximum temperature range

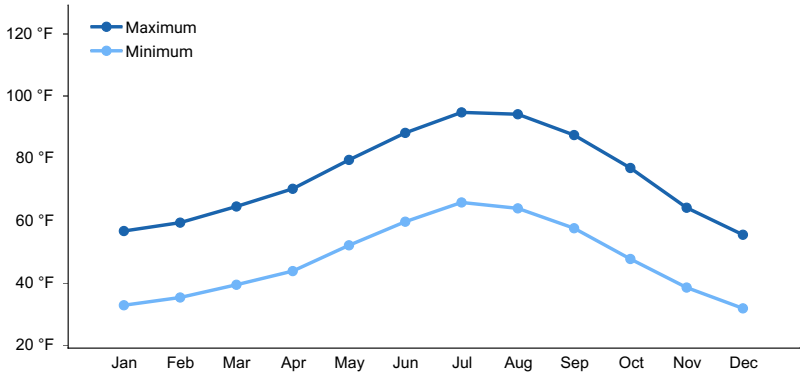


Figure 4. Monthly average minimum and maximum temperature

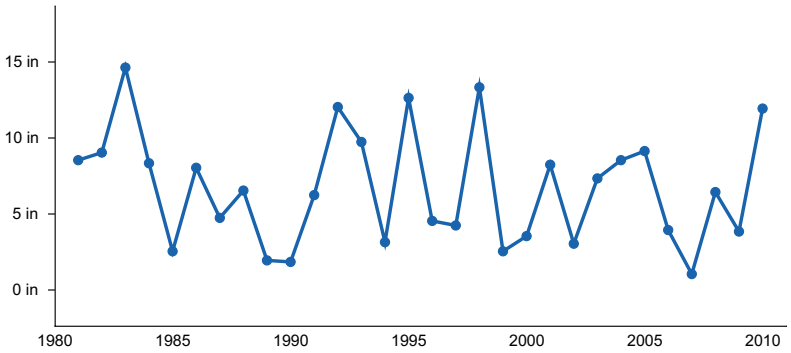


Figure 5. Annual precipitation pattern

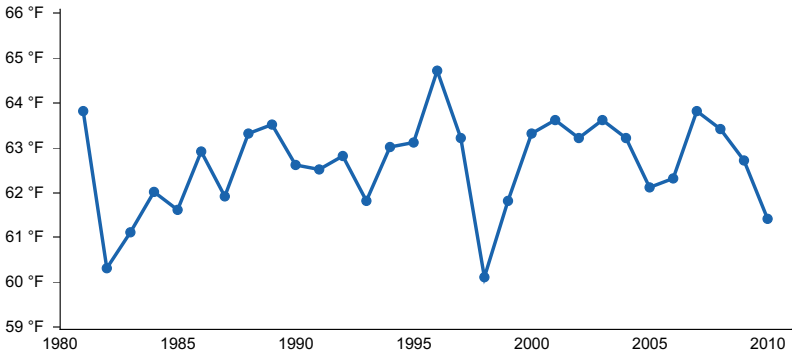


Figure 6. Annual average temperature pattern

Climate stations used

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

Influencing water features

No water features are associated with this site.

Soil features

The soils on this ecological site are formed from colluvium and residuum derived from granite. Soils are very shallow or shallow to highly weathered bedrock over unweathered bedrock, gravelly, and have sandy loam textures. They contain an argillic horizon above the weathered bedrock. Permeability is moderately rapid above the bedrock, and soils are well drained. Runoff is very high. Available water capacity is very low. Soils classify as loamy, mixed, superactive, thermic, shallow Typic Haplargids.

Soil survey area - Map unit symbol - Component
CA682 - 5201 - Pinyonpeak (major)
CA682 - 5205 - Pinyonpeak
CA682 - 5500 - Pinyonpeak
CA682 - 6001 - Pinyonpeak (major)
CA682 - 6002 - Pinyonpeak
CA682 - 6601 - Pinyonpeak (major)

Table 4. Representative soil features

Parent material	(1) Colluvium–granite (2) Residuum–granite
Surface texture	(1) Gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Soil depth	6–14 in
Surface fragment cover <=3"	60–90%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	0.3–0.7 in
Calcium carbonate equivalent (0-40in)	0–1%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	6.6–7.8
Subsurface fragment volume <=3" (Depth not specified)	55–90%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This ecological site is on hills on soils that are very shallow or shallow to bedrock. The soil has a root-limiting layer between 6 and 14 inches (15 to 36 centimeters). The plant community is a mix of early- through late-seral species that is likely affected by the soil depth.

Blackbrush (*Coleogyne ramosissima*) is the dominant species on this ecological site. It has a shallow root system,

and it is commonly found on stable soils and on soils with a root-restricting layer (Anderson, 2001). It is thought to be a paleoendemic species, once having a wider range but now limited to its present extent by environmental conditions (Stebbins and Major, 1965). It has infrequent germination events, low seedling survival, and does not readily re-establish on disturbed sites (Anderson, 2001). Its presence suggests that major disturbances to this ecosite are not common.

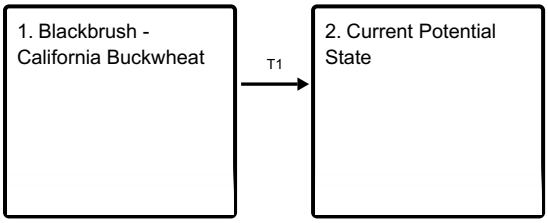
Several early- and mid-seral species on this ecosite often indicate disturbance. These include California buckwheat (*Eriogonum fasciculatum*), Sandberg bluegrass (*Poa secunda*), burrobrush (*Hymenoclea salsola*), Cooper's goldenbush (*Ericameria cooperi*), and green rabbitbrush (*Ericameria teretifolia*). However, rather than indicating disturbance, their presence on this ecosite may reflect a filling of niches that late seral species have not filled due to edaphic restrictions. These species are adapted to a range of growing conditions. California buckwheat has exhibited shallow rooting patterns (Kummerow et al., 1977), as have Sandberg bluegrass and burrobrush (Howard, 1997; Tesky, 1993). Information on the rooting abilities of Cooper's goldenbush and green rabbitbrush is minimal. However, Ericameria spp. readily fill open niches as they are often early colonizers of disturbed or bare areas.

Wildfire may affect this ecosite. Wildfire has historically been a rare event in the desert because widely spaced shrubs and discontinuous fuels prevented fires from spreading easily. Spread of invasive annual species in the Mojave Desert creates a more continuous and easily ignitable fuel bed, particularly after heavy rains, and increases the fire frequency and the size of the area disturbed (Clarke, 2006; Howard, 2006). Invasive annual plants such as red brome (*Bromus rubens*) often re-colonize these disturbed sites (Brooks et al., 2003). Red brome and Mediterranean grass (*Schismus arabicus*) are present in trace amounts on this ecosite. Their spread would increase the risk and frequency of fire on this ecosite. Non-native forbs such as redstem filaree (*Erodium cicutarium*) are also present and may produce a large amount of biomass.

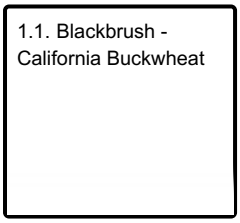
Blackbrush communities are often significantly altered by fire or other widespread disturbance. Fires in blackbrush communities were often stand-replacing (Brooks et al., 2003), but historical fire return intervals of more than 100 years allowed for slow re-establishment (Anderson, 2001). Because of limited recolonization, the early- and mid-seral species would become more common. Ample seed production, easy seed dispersal, and rapid growth help these species establish on disturbed sites. Sandberg bluegrass also has the ability to resprout following a disturbance as well as reestablish by seed. Reduced competition from late seral species for light, water, and nutrients facilitates plant growth.

State and transition model

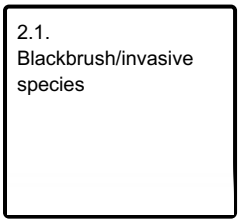
Ecosystem states



State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Blackbrush - California Buckwheat

The Blackbrush - California Buckwheat State represents the plant community and ecological dynamics. This state includes the biotic communities that become established on the ecological site if all successional sequences are completed under the natural disturbance regimes. The reference state is generally dominated by blackbrush, however depending on disturbance history, native grasses, forbs, or other shrubs may occupy significant composition in the plant community. Primary disturbance mechanisms include climate fluctuations and native herbivore grazing. Timing of these natural disturbances dictates the ecological dynamics that occur. The reference state is self sustaining and resistant to change due to high resistance to natural disturbances and high resilience following natural disturbances. Once invasive plants establish, return to the reference state may not be possible. Reference State: Plant community resistant to fluctuations in climate. Indicators: A community dominated by blackbrush where native perennial grasses and forbs may or may not be present. Feedbacks: Natural fluctuations in climate that allow for a self sustaining blackbrush and native grass community. Any disturbance that may allow for the establishment of invasive species. At-risk Community Phase: All communities are at risk when native plants are stressed and nutrients become available for invasive plants to establish. Trigger: The establishment of invasive plant species.

Community 1.1
Blackbrush - California Buckwheat

The interpretive plant community is the reference plant community prior to European colonization. Edaphic conditions are important for shaping this community. The dominant plant in this community is blackbrush (*Coleogyne ramosissima*), a late seral species commonly found on shallow soils. The shallow root system of blackbrush lets it succeed on soils with a root-limiting layer. An argillic horizon at shallow depth may also aid blackbrush survival due to its higher available water capacity. Other species often found in late seral communities are present in small amounts. These include Nevada jointfir (*Ephedra nevadensis*) and water jacket (*Lycium andersonii*). They have deep, expansive root systems that are likely limited by the shallow soil. This may affect the success of these plants on this ecosite. Sandberg bluegrass (*Poa secunda*) is the major herbaceous species on this ecosite. Other species present are California buckwheat (*Eriogonum fasciculatum*), burrobrush (*Hymenoclea salsola*), Cooper's goldenbush (*Ericameria cooperi*), and green rabbitbrush (*Ericameria teretifolia*). These shallow-rooted species commonly indicate disturbance, but may be filling a niche as many late seral species cannot thrive on shallow soils. They will likely persist in this community. Their niche will remain available because blackbrush will not likely spread into areas where individuals of these shrubs have died. The potential natural vegetation community is 70 percent shrubs, 20 percent grasses, and 10 percent forbs.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	198	264	330
Grass/Grasslike	54	72	90
Forb	48	64	80
Total	**300**	**400**	**500**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-20%
Grass/grasslike foliar cover	5-7%
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	10-15%
Grass/grasslike basal cover	2-3%
Forb basal cover	1-2%
Non-vascular plants	0%
Biological crusts	0%
Litter	30-35%
Surface fragments >0.25" and <=3"	50-60%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	3-5%

Table 8. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	2-3%
>0.5 <= 1	–	2-3%	–	–
>1 <= 2	–	5-7%	5-7%	–
>2 <= 4.5	–	5-7%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

State 2
Current Potential State

The Current Potential State is similar to the reference state, however invasive species are present. This state is generally dominated by blackbrush. Primary disturbance mechanisms include climate fluctuations, native herbivore grazing, domestic livestock grazing, and surface disturbances such as road and pipeline development and off road vehicle (OHV) use. Due to lack of disturbed areas, the community responses to such disturbances are not documented, and are not currently included in the state and transition model. The current potential state is still self sustaining; but is losing resistance to change due to lower resistance to disturbances and lower resilience following disturbances, and new drastic disturbances such as fire being more likely to occur. Current Potential State: Plant communities resistant to climate fluctuations, herbivore grazing, and surface disturbance. Indicators: A community dominated by blackbrush where native perennial grasses and forbs may or may not be present. Invasive grasses and forbs are present. Feedbacks: Natural fluctuations in climate that allow for a self sustaining blackbrush and grass community.

Community 2.1
Blackbrush/invasive species

Community Phase 2.1 is dominated by blackbrush, as in Community Phase 1.1. Non-native invasive species are present in the plant community in Community Phase 2.1.

Transition T1
State 1 to 2

This transition is from the native perennial warm and cool season grass understory in the reference state to a state that contains some invasive species. Events may include season long continuous grazing of perennial grasses, prolonged drought, and surface disturbances, etc. Invasive species such as cheatgrass have been known to invade intact perennial plant communities with little to no disturbances. Once invasive plants are found in the plant community a threshold has been crossed.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
1	**Shrubs**			114–190	
	blackbrush	CORA	*Coleogyne ramosissima*	96–160	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	12–20	–
	water jacket	LYAN	*Lycium andersonii*	6–10	–
2	**Opportunistic Shrubs**			84–140	
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	36–60	–
	burrobrush	HYSA	*Hymenoclea salsola*	18–30	–
	Cooper's goldenbush	ERCO23	*Ericameria cooperi*	18–30	–
	green rabbitbrush	ERTE18	*Ericameria teretifolia*	12–20	–
Grass/Grasslike					
3	**Perennial Grass**			54–90	
	Sandberg bluegrass	POSE	*Poa secunda*	54–90	–
Forb					
3	**Perennial Forbs**			3–5	
	Sandberg bluegrass	POSE	*Poa secunda*	54–90	–
5	**Annual Forbs**			45–75	
	woollystar	ERIAS	*Eriastrum*	18–30	–
	brittle spineflower	CHBR	*Chorizanthe brevicornu*	12–20	–
	Pringle's woolly sunflower	ERPR4	*Eriophyllum pringlei*	6–10	–
	combseed	PECTO	*Pectocarya*	6–10	–
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	3–5	–

Animal community

Blackbrush is not a preferred browse species for wildlife or domestic livestock (Anderson, 2001). Small mammals and birds may eat blackbrush seeds. Blackbrush also provides good cover for small animals. Grasses and forbs are important food sources but are present in the reference community in small amounts.

The major land use on this ecological site is livestock grazing. Grasses are valuable species for livestock but are not common in the reference plant community. Grasses will become more common when the reference state is

disturbed. Growth of grasses may be facilitated by grazing, but grasses will likely decrease with uncontrolled grazing.

Recreational uses

This site is very beautiful and provides many photographic opportunities. Spring wildflower displays provide many photographic opportunities. Several existing off-highway vehicle trails provide touring opportunities through this ecosite.

Inventory data references

1 SCS Range 417 Production and Composition Record (2004)
1 Dry Weight Rank transect (2004)

Type locality

Location 1: Kern County, CA	
UTM zone	N
UTM northing	3917745
UTM easting	403786
Latitude	35° 23′ 54″
Longitude	118° 3′ 34″
General legal description	The site is located in the Jawbone-Butterbredt ACEC off route SC99, about 1/2 mile south of the junction with SC171.

Other references

Anderson, Michelle D. 2001. *Coleogyne ramosissima*. 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/ [2007, January 4].

Brooks, M.L., T.C. Esque, T. Duck. 2003. Fuels and fire regimes in creosotebush, blackbrush, and interior chaparral shrublands. Report for the Southern Utah Demonstration Fuels Project. United States Department of Agriculture, Forest Service, Rocky Mountain Research Station, Montana. 18pp.

California State University (CSU) Desert Studies Center. 2002. Desert Climate. CSU Desert Studies Center, Soda Springs, CA. Online. http://biology.fullerton.edu/facilities/dsc/zz_climate.html. Accessed 28 November 2006.

Clarke, C. 2006. The year we lost the deserts. Earth Island Journal. 20(4): 24-56.

Howard, J.L. 1997. *Poa secunda*. 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, October 19].

Howard, J.L. 2006. Nonnative annual grass fuels and fire in the Mojave Desert. 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, June 06].

Kummerow, J., D. Krause, and W. Jow. 1977. Root systems of chaparral shrubs. Oecologia 29: 163-177.

Stebbins, G.L. and J. Major. 1965. Endemism and speciation in the California flora. Ecological Monographs 35(1): 1-35.

Tesky, J.L. 1993. *Hymenoclea salsola*. 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, September 26].

United States Department of Agriculture, Natural Resources Conservation Service. 2022. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture, Agriculture Handbook 296.

Western Regional Climate Center (WRCC). 2002. Western U.S. Climate Historical Summaries [Online]. Desert Research Institute, Reno, NV. Online. http://www.wrcc.dri.edu/Climsum.html. Accessed 28 November 2006.

Contributors

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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	05/10/2025
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:

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17. **Perennial plant reproductive capability:**
