USDA Natural Resources
Conservation Service

Ecological site R030XC234CA
Fine-Loamy Very Deep Slopes

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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

Major Land Resource Area (MLRA) 30, Mojave Desert, 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 climate of the area is hot and dry. Hyperthermic and thermic soil termperature regimes are common with exceptions at higher elevations (generally above 5000 feet) where mesic, cryic and frigid soil temperature regimes may occur. Typic aridic soil moisture regimes are common and widespread throughout the MLRA. Elevations range from below sea level to over 12,000 feet in the higher mountain areas found within the MLRA. Due to the extreme elevational range found within this MLRA, Land Resource Units (LRUs) were designated to group the MLRA into similar land units.

LRU Description:

The Bi-Modal Semi-Arid (XC) Land Resource Unit (LRU), represents a semi-arid zone as defined by the United Nations Food and Agriculture Organization and is a semi-arid region distinguished by other semi-arid regions of the Mojave by the amounts of summer precipitation it receives. Semi-arid regions in the western Mojave can experience hot and very dry summers whereas regions within the XC LRU can receive more than 2.5 inches (63.5 mm) of rain during the months of July, August and September. The Bi-Modal Semi-Arid LRU is found primarily in eastern Mojave such as in Nevada at the higher elevations, in California in the New York, Providence, Castle and Clark Mountain Ranges as well as the Cerbat and Virgin Mountains of Arizona. Elevations range from approximately 4000 to 12,000 feet (1500 to 3650 meters) and precipitation ranges 8 to 18 inches (200 – 450 mm) per year in the form of rain. Snow is not uncommon in this LRU with the chance of receiving 3 to 48 inches of snow per year.
Due to the relatively high volume of summer rainfall, soil moisture regimes may have been designated as ustic-aridic, however emerging soil moisture data suggests the xeric-aridic soil moisture regime may be more appropriate and is likely to dominate this LRU. Soils within this LRU also have a cool thermic or cooler soil temperature regime. The combination of cooler temperatures [mean annual air temperatures lower than 62 degrees F (17 degrees C)] with summer monsoonal rains help to create a unique climate within the Mojave Desert which may be more similar to the Southern Nevada Basin and Range (MLRA). Vegetation at the lower elevations of this LRU includes blackbrush, Joshua tree, juniper, pinyon pine, and mountain big sagebrush. At the higher elevations, vegetation includes oaks, Mojave sagebrush, Ponderosa pine, white fir, limber pine and the Great Basin bristlecone pine.

Ecological site concept

This ecological site occurs on toeslopes and concave mountain and hillslopes with very deep soils derived from andesitic parent material with fine-loamy textures. Soils have an argillic horizon shallow to the soil surface. Elevations range from 4400 to 5800 feet. The soil moisture regime is aridic bordering on ustic and the soil temperature regime is cool thermic.

Blackbrush (Coleogyne ramosissima) is the dominant shrub within this elevation zone, and dominates the reference state of this site. Andesitic parent material contributes to fine textured soils with high soil moisture holding capacity

and relatively high fertility. This, with increased run-on in concave areas and footslopes enhance the production potential of this ecological site, and disturbed states are characterized by very high perennial grass production, dominated by big galleta (Pleuraphis rigida) and black grama (Bouteloua eriopoda).

Associated sites

R030XB015NV	**SHALLOW GRAVELLY SLOPE 7-9 P.Z.** Occurs on adjacent slopes with lithic soils. Production is lower, and grass production in the altered state is not as high.
R030XY219CA	**Ustic Ephemeral Drainageway Order 3** Occurs in adjacent large drainages.

Similar sites

R030XB029NV	**SHALLOW GRAVELLY LOAM 5-7 P.Z.** Soils are shallow to a duripan, creosote bush (Larrea tridentata) is an important shrub.
R030XB015NV	**SHALLOW GRAVELLY SLOPE 7-9 P.Z.** Soils are very shallow to shallow. Production is lower. Perennial grass production in the altered state is not as high.
R030XB107NV	**COARSE GRAVELLY LOAM 5-7 P.Z.** Occurs on fan remnants, fan aprons and inset fans at lower elevations.
R030XB071NV	**VOLCANIC SLOPE 7-9 P.Z.** Lithic soils with coarse textures. Production is lower.
R030XB014NV	**SHALLOW GRAVELLY LOAM 7-9 P.Z.** Occurs on moderately to very deep soils on fan aprons and fan remnants. Joshua tree (Yucca brevifolia) is an important species.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Coleogyne ramosissima*
Herbaceous	(1) *Pleuraphis rigida* (2) *Bouteloua eriopoda*

Physiographic features

This ecological site is found on toeslopes and concave backslopes of hills and mountains. Elevations range from 3400 to 5900 feet and slopes range from 8 to 50 percent. Runoff class is medium to high.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	3,400–5,900 ft
Slope	8–50%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this ecological site is characterized by hot temperatures, aridity, and a bimodal precipitation pattern. Precipitation falls as rain, with 40 percent falling in summer between July and October, and 49 percent falling in winter between November and March. The mean annual precipitation is 7 to 9 inches and mean annual air

temperature is 55 to 63 degrees F. The frost free period is 201 to 240 days, and the freeze free period is 243 to 273 days.

Maximum and minimum monthly climate data for this ESD were generated by the Climate Summarizer (http://www.nm.nrcs.usda.gov/technical/handbooks/nrph/Climate_Summarizer.xls) using data from the following climate stations:

45890, Mountain Pass, CA (Period of record = 1955 to 2005) [1]

26739, Searchlight, NV (Period of record = 1914 to 2006) [1]

The data from multiple weather stations were combined to most accurately reflect the climatic conditions of this ecological site. These weather stations occur at the mid-elevation range of this ecological site.

Table 3. Representative climatic features

Frost-free period (average)	240 days
Freeze-free period (average)	273 days
Precipitation total (average)	9 in

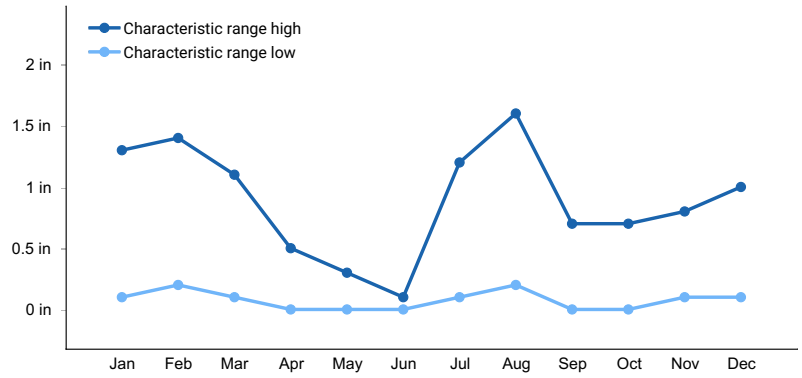


Figure 1. Monthly precipitation range

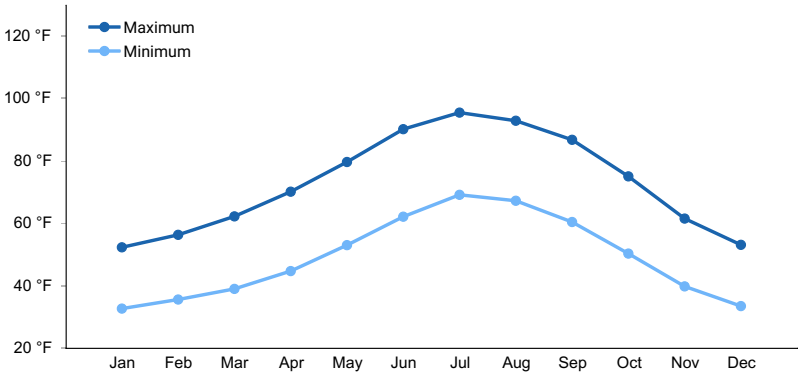


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

Soil features

The soils associated with this ecological site formed in residuum and colluvium from andesitic parent material. They are very deep to a lithic contact, and an argillic horizon is very shallow to shallow to the soil surface. Surface textures are gravelly loam and sandy loam and subsurface textures are gravelly and very gravelly loam and sandy loam. Surface rock fragments less than 3 mm in diameter range from 57 to 60 percent, and larger fragments range from 3 to 15 percent. Soils have a thermic temperature regime and a typic aridic bordering on ustic soil moisture regime. The soil series that have been correlated with this ecological site include Parched.

The Parched series consists of very deep, well-drained soils that formed in residuum and colluvium weathered from andesite. Surface textures are gravelly sandy loams with gravelly loams and very gravelly loams beneath. Surface rock fragments range from 35 to 70 percent, with 32 to 60 percent gravel and 7 to 25 percent cobbles. An argillic horizon occurs at depths of 1 to 4 inches. Parched soils are on side slopes of hills with slopes from 15 to 50 percent. These soils are Fine-loamy, mixed, superactive, thermic Ustic Haplargids.

Table 4. Representative soil features

Parent material	(1) Residuum–andesite
Surface texture	(1) Gravelly loam (2) Sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow
Soil depth	60–0 in
Surface fragment cover <=3"	57–60%
Surface fragment cover >3"	3–15%
Available water capacity (0-40in)	2.8–7.4 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–4
Soil reaction (1:1 water) (0-40in)	6.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	22–35%
Subsurface fragment volume >3" (Depth not specified)	0–9%

Ecological dynamics

Abiotic factors
A cool thermic soil temperature regime with an argillic horizon shallow to the soil surface supports dominance by blackbrush, which is the dominant shrub within the climatic envelope of this ecological site. Fertile, very deep, fine-loamy soils derived from andesitic parent material with landscape positions that receive additional run-on increase the production potential of this ecological site, and disturbed states are characterized by high perennial grass production, dominated by the warm season perennial bunchgrasses big galleta and black grama. The ustic soil moisture regime allows black grama to be a dominant species; it does not occur where there is not significant summer precipitation.

Disturbance dynamics
The primary disturbances influencing this ecological site are fire, invasion by non-native annual plants, livestock grazing, and drought. Land clearing associated with ranching and settlement has also influenced this site.

The historic natural fire regime for this ecological site was stand-replacing fire at a century-long or greater interval that coincided with wet climatic phases favoring increased fuel production (i.e. the warm phase of the Pacific Decadal Oscillation cycle) (e.g. Webb 1987, Brooks et al. 2007, Abella et al. 2009, Brooks and Chambers 2011, Brooks et al. 2013). Blackbrush is killed by moderate to severe intensity fire, and is slow to colonize burned areas, and the long historic fire-return interval allowed for recovery to pre-burn densities. Patchy small fires would have

occurred with regularity. The Chemehuevi Indians, a band of the Southern Paiutes who occupied the eastern Mojave Desert, were known to burn grasslands to promote productivity of food sources, as well as to facilitate collection of grass seeds (Laird, 1984 cited by Sutton 1989). There are numerous references for intentional burning by the Southern Paiutes, including burning grasslands, for rabbit drives, to enhance native tobacco production, and to increase productivity of basketry materials (references within Williams 2003). There is not direct evidence for Native American burning of this ecological site; however, it is likely that at some scale, Native Americans intentionally maintained the productive perennial grass community that developed in response to fire. These would have existed as patches within the larger intact extent of the historic site.

Naturalization of non-native annual species such as red brome (*Bromus rubens*), cheatgrass (*Bromus tectorum*), and redstem storks bill (*Erodium cicutarium*) with European exploration and settlement from the 1860s through the 1900s (e.g. Brooks and Chambers 2011) caused a transition from the reference state, which contained only native species, to a state that included non-natives (State 2). Invasion by non-native annual grasses may have then increased the flammability of the invaded community by providing a continuous fine fuel layer between shrubs (e.g. Brown and Minnich , Brooks , Brooks et al. 2004, Brooks and Chambers 2011). After fire, these communities appear to be more susceptible to invasion by exotic grasses, which may lead to a grass-fire cycle (D"Antonio and Vitousek 1992).

Recurrent fire prevents blackbrush recovery, and is primarily responsible for a transition to an altered state characterized by productive perennial grasses and the absence of blackbrush (State 3). The Bureau of Land Management (BLM) burned extensive stands of blackbrush for range improvement from the 1930s to at least the 1960s (Brooks, 2013). Documentation doesn’t exist, but it is probable that intentional burning of the reference community and/or the grassland community occurred with earlier ranching, which began in the area in 1875 (NPS).

Cattle grazing influenced the community dynamics of States 2 and 3. Ranching was established in the eastern Mojave desert in approximately 1875 (Nystrom 2003). Grazing occurred unregulated in the area until the passage of the Taylor Grazing Act in 1934, which divided public land into allotments that were regulated by the Bureau of Land Management (BLM), and among other things, called for fenced ranges and multiple developed water sources (http://www.blm.gov/wy/st/en/field_offices/Casper/range/taylor.1.html). The Federal Land Policy and Management Policy Act of 1976 (FLPMA) brought further regulations, including 10-year grazing permits. In 1994 the California Desert Protection Act created the Mojave National Preserve, and the National Park Service took over management of grazing allotments in much of the eastern Mojave. All of the area occupied by this ecological site within the Mojave National Preserve was retired from grazing in 2000 (Lanfair Valley and Kessler Spring Allotments) or 2003 (Crescent Peak Allotment) (Kim 2004).

Heavy cattle grazing in the arid west has been shown to have numerous negative effects on vegetative communities, including decrease cryptogram crust cover, decrease seedling survival, decrease total biomass, decrease perennial grass and shrub cover, and decrease litter cover (Jones 2000). In addition soils and hydrology may be impacted, with reduced infiltration, increased runoff and erosion (e.g. Rauzi and Hanson 1966, Rauzi and Smith 1973, Jones 2000), and soil compaction, with increased bulk density and decreased pore space (e.g. Rauzi and Hanson 1966, Abdel-Magid et al. 1987). Grazing in blackbrush dominated communities may cause significant declines in perennial grasses and forbs, total shrub cover, and cryptogram crust cover (Jeffries and Klopatek 1987). Grazing may cause shifts in species composition from more palatable to less palatable species, and to species more tolerant of mechanical disturbance, or with a shorter life-cycle.

Drought is an important shaping force in Mojave Desert plant communities (Webb et al. 2003, Hereford et al. 2006). Long-term or severe drought will cause declines in vegetative cover and biomass due to mortality of short-lived perennial shrubs and perennial grasses (Webb et al. 2003, Bowers 2005, Hereford et al. 2006, Miriti et al. 2007), branch-pruning, and or limited recruitment of long-lived shrubs and trees during drought (e.g. Hereford et al. 2006, Miriti et al. 2007), and lack of emergence of annual species (Beatley 1969, 1974, 1976). Drought may thus favor long-lived shrubs over shorter-lived shrubs and grasses, reducing the importance of these groups in the vegetation community. Drought may exacerbate grazing impacts, because drought-stressed plants are more prone to mechanical damage (Abdel-Magid et al. 1987). The effects of fire during drought are more severe, with both black grama and big galleta potentially killed by fire when the majority of plant material is dormant (Matthews 2000, Simonin 2000). Drought impacted communities are not presented as a separate phase in the State-and-Transition model for this site, but a discussion of how drought impacts influence different phases is included in the narrative.

State and transition model

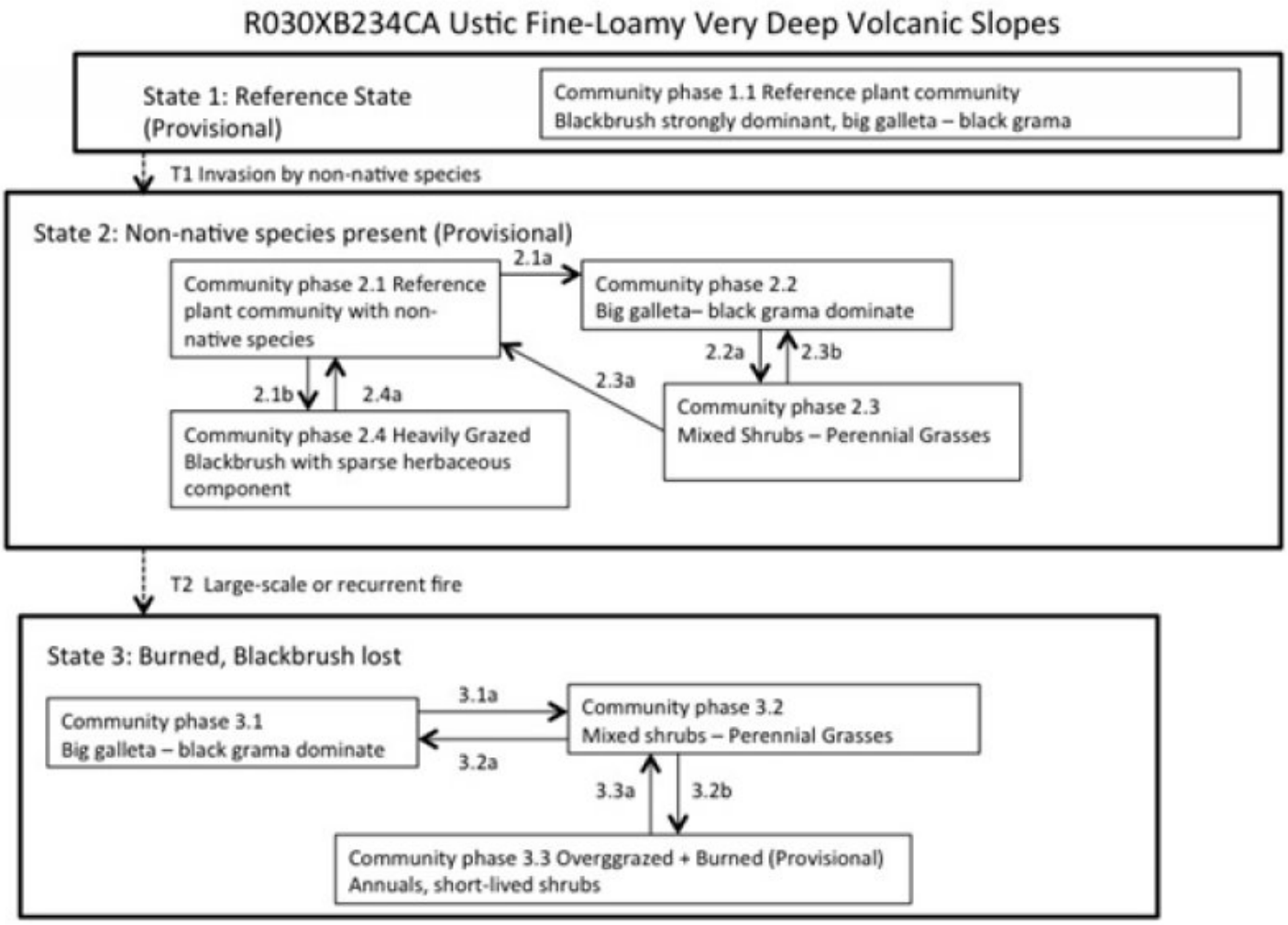


Figure 3. R030XB234CA

State 1
Reference State (Provisional)

This state represents the historic range of variability for this ecological site, pre-European settlement. This state no longer exists due to the naturalization of non-native species in the Mojave Desert. Data for this State does not exist, but community dynamics would have been similar to State 2, except with only native species present and no grazing impacted community phases.

Community 1.1
Reference plant community

The reference plant community was strongly dominated by blackbrush, and perennial grasses including big galleta and black grama were an important component. Blackbrush dominates surrounding undisturbed slopes and fan piedmonts within the elevation range of this ecological site, and is common on argillic soils throughout its range (ref). Historic accounts of the slopes within the geographic reference of this ecological site describe Joshua trees and a continuous thick covering of underbrush (Snorf, 1991). The abundance of perennial grasses in the burned state of this ecological site implies that they would have been a significant component of the reference community. A diversity of secondary shrubs and perennial forbs would have been sparsely present, and native annuals would have been present with adequate precipitation. Sparse Joshua tree (*Yucca brevifolia* ssp. jaegariana) was present, and Utah juniper was present in the higher elevation zones of this site.

State 2
Non-native species present (Provisional)

Non-native annuals, including red brome (*Bromus rubens*) and red-stem storks bill (*Erodium cicutarium*) are naturalized in this state. Their abundance varies with precipitation, but they are at least sparsely present (as current year's growth or present in the soil seedbank). Data for this state does not currently exist, due to intense land use of the geographic reference area of this site beginning the early 1800's, which included fire, mining, land clearing, hog farming, and cattle grazing (Snorf, 1991). Grazing of the reference community would have led to a blackbrush-dominated community with a reduced grass component.

Community 2.1
Reference plant community, non-native species present

This community phase is identical to community phase 1.1, except that non-native species including red brome and redstem storks bill were present. Abundant red brome would make this community phase more susceptible to fire. Vegetation cover, production and density would decline during periods of drought and recover during wet periods. Grazing during drought, and during the summer growing season will have the most adverse impacts. Multiple wet years produce a high abundance of annuals, and conditions most susceptible to burning.

Community 2.2
Big Galleta - Black grama

Productive perennial grasses, dominated by black grama and big galleta, characterize this plant community. This community will not develop immediately after fire, with recovery dependent on climate and grass condition at time of fire, and precipitation after fire. If fire occurs when big galleta and black grama are drought stressed with little live material, plants may be killed and recovery will be slow. If fire occurs with mostly live material, damage will be largely superficial and recovery rapid. Average to above average precipitation, especially during the summer growing season will hasten recovery, while drought will slow recovery. Data does not exist for this community, but it was likely similar to community phase 3.1. The difference between the two is a matter of scale, with smaller extent and lower severity fires that leave a blackbrush seed source allowing for eventual recovery of a blackbrush dominated community with no additional disturbance.

Community 2.3
Mixed shrubs - Perennial Grasses

This community phase is characterized by an increase in shrub cover and density, and a decrease in perennial grass dominance. Blackbrush seedlings begin to colonize.

Community 2.4
Heavily Grazed

Significant declines in perennial grass and forb density and cover, and a decrease in shrub cover characterize this community phase. Blackbrush is still strongly dominant. Cryptobiotic crust declines. Reduced vegetation and crust cover and soil compaction may decrease infiltration rates and increase run-off, leading to a risk of soil erosion. This plant community is more vulnerable to adverse impacts from burning. Because the perennial grass component, which recovers quickly and becomes dominant in the burned phase of the reference community is missing, fire in the grazed community phase is at risk for transition to a degraded community dominated by annuals and short-lived shrubs.

Pathway 2.1a
Community 2.1 to 2.2

Occurs with fire.

Pathway 2.1b
Community 2.1 to 2.2

Occurs with grazing, light to heavy.

Pathway 2.2a
Community 2.2 to 2.3

This pathway may occur with time without fire (40+ years), with heavy or summer grazing, or with drought.

Pathway 2.3a
Community 2.3 to 2.1

Time without fire (100+ years) or other disturbance.

Pathway 2.3b
Community 2.3 to 2.2

Occurs with fire.

Pathway 2.4a
Community 2.4 to 2.1

Occurs with significant time and release from grazing. It is unknown how long recovery may take; blackbrush communities retired from heavy grazing for 10 years showed no recovery (Jeffries and Klopatek 1987).

State 3
Burned, blackbrush lost

This state exists when long-lived, dominant blackbrush is lost from the community. This occurs with large-scale fires, where a blackbrush seed source is not available to recolonize, or with recurrent fire that does not provide a long enough interval to allow for blackbrush recovery.

Community 3.1
Big galleta-Black grama dominate

Figure 4. Community Phase 3.1

This community phase is dominated by warm season perennial grasses, big galleta and black grama. A diversity of short- and long-lived shrub species is present but contributes only ~ 5% of annual production. Nevada jointfir (*Ephedra nevadensis*), eastern Mojave buckwheat (*Eriogonum fasciculatum*), buck-horn cholla (*Cylindropuntia acanthocarpa*), banana yucca (Yucca bacata), and Mojave yucca (*Yucca schidigera*) are common shrub species. Perennial forbs contribute approximately 8% of annual production. Desert trumpet (*Eriogonum inflatum*), desert globemallow (Spaeralcea ambigua), brownplume wirelettuce (*Stephanomeria pauciflora*), and whitestem paperflower (*Psilostrophe cooperi*) are common perennial forbs. Native summer annual grasses may be abundant given adequate summer precipitation. Sixweeks grama (*Bouteloua barbata*) and sixweeks threeawn (*Aristida*

adscensionis) are the dominant species, but needle grama (Bouteloua aristoides) may also be present. Both winter and summer native annual forbs may be present if precipitation is adequate. Fringed amaranth (*Amaranthus fimbriatus*) and spiderling (Boerhavia sp.) are common summer annuals. The non-native annual grass red brome (*Bromus rubens*) and the non-native annual forb redstem storks bill (*Erodium cicutarium*) may be abundant. Fire in this community generally provides a positive feedback loop to maintain the plant community. Recovery will be slower if fire occurs during drought when perennial grasses are dormant, or if drought occurs after fire. Grazing after fire may prevent recovery and should be avoided.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	575	815	1065
Forb	55	80	100
Shrub/Vine	40	55	70
Tree	0	1	20
Total	**670**	**951**	**1255**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	2-19%
Grass/grasslike foliar cover	40-67%
Forb foliar cover	2-15%
Non-vascular plants	0%
Biological crusts	0%
Litter	1-3%
Surface fragments >0.25" and <=3"	16-40%
Surface fragments >3"	2-6%
Bedrock	0-1%
Water	0%
Bare ground	1-10%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	5-23%	0-8%
>0.5 <= 1	–	–	0-11%	0-4%
>1 <= 2	–	0-2%	28-69%	7-12%
>2 <= 4.5	–	4-16%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Community 3.2
Mixed shrubs - Perennial Grasses

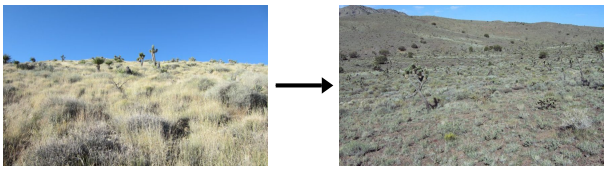
Figure 6. Community Phase 3.2

This community phase is characterized by lower productivity, density and cover in the perennial grass component, and an increase in shrub importance. The species list remains similar to community phase 3.1. If the community develops in response to overgrazing, unpalatable shrubs and grasses may become dominant. Species likely to increase include purple needlegrass (*Aristida purpurea*), fluffgrass (*Dasyochloa pulchella*), snakeweeds (*Gutierrezia sarothrae* and microcephala), Coopers goldenbush (*Ericameria cooperi*), buck-horn cholla, burrobush (*Hymenoclea salsola*), catclaw acacia (Acacia gregii), and yellow rabbitbrush (*Chrysothamnus viscidiflorus*). Indian rushpea (*Hoffmannseggia glauca*), a usually uncommon native colonizer, may become abundant. Increased bare ground is susceptible to erosion, which may be seen in pedestalling of existing plants, and rills. Fine-textured soils are susceptible to compaction, which can exacerbate erosion, increase run-off, and reduce suitable area available for seed germination. This community is at-risk if overgrazing continues or if the community burns.

Community 3.3
Overgrazed + Burned (Provisional)

This is a degraded community phase that develops with a lack of perennial grasses to recover and colonize after fire. Annuals and short-lived shrubs dominate. This community is at high risk of soil erosion, and rest from grazing is essential.

Pathway 3.1a
Community 3.1 to 3.2

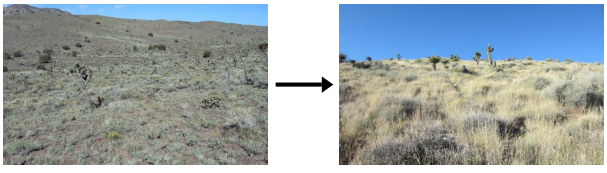


Big galleta-Black grama dominate

Mixed shrubs - Perennial Grasses

This pathway occurs with heavy or summer season grazing, with sustained drought, especially with a lack of summer precipitation needed by the dominant warm season perennial grasses, or with time without fire.

Pathway 3.2a
Community 3.2 to 3.1



Mixed shrubs - Perennial Grasses

Big galleta-Black grama dominate

This pathway occurs with rest from grazing, and fire.

Pathway 3.2b
Community 3.2 to 3.3

This pathway occurs with continued heavy grazing and fire.

Pathway 3.3a
Community 3.3 to 3.2

Occurs with rest from grazing and time without fire. Drought will prolong the persistence of the degraded community, while moisture will promote recovery.

Transition 1
State 1 to 2

Transition 1
State 1 to 2

This transition occurred with naturalization of non-native annual species such as red brome (*Bromus rubens*), cheatgrass (*Bromus tectorum*), and redstem storks bill (*Erodium cicutarium*) with European exploration and settlement from the 1860s through the 1900s (e.g. Brooks and Chambers 2011). The ubiquitous presence of non-native annuals means that removing them entirely is essentially impossible.

Transition 2
State 2 to 3

This transition occurs with large-scale or recurrent fire.

Additional community tables

Table 8. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
1	**Native shrubs**			40–70	
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	3–40	0–3
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	1–30	0–1
	Nevada jointfir	EPNE	*Ephedra nevadensis*	3–15	0–4
	Mojave yucca	YUSC2	*Yucca schidigera*	0–15	1–3
	water jacket	LYAN	*Lycium andersonii*	0–15	0–2
	buck-horn cholla	CYAC8	*Cylindropuntia acanthocarpa*	1–9	0–2
	littleleaf ratany	KRER	*Krameria erecta*	0–4	0–2
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–4	0–1
	burrobrush	HYSA	*Hymenoclea salsola*	0–2	0–1
	turpentine bush	ERLA12	*Ericameria laricifolia*	0–1	0–1
	green rabbitbrush	ERTE18	*Ericameria teretifolia*	0–1	0–1
	threadleaf snakeweed	GUMI	*Gutierrezia microcephala*	0–1	0–1
	Cooper's goldenbush	ERCO23	*Ericameria cooperi*	0–1	0–1
	catclaw acacia	ACGR	*Acacia greggii*	0–1	0–1
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–1	0–1
	tulip pricklypear	OPPH	*Opuntia phaeacantha*	0–1	0–1

	desert polygala	POAC2	*Polygala acanthoclada*	0–1	0–1
	banana yucca	YUBA	*Yucca baccata*	0–1	0–1
Grass/Grasslike					
2	**Native perennial grasses**			300–955	
	big galleta	PLRI3	*Pleuraphis rigida*	250–955	20–45
	black grama	BOER4	*Bouteloua eriopoda*	10–360	5–35
	bush muhly	MUPO2	*Muhlenbergia porteri*	0–4	0–2
	purple threeawn	ARPU9	*Aristida purpurea*	0–1	0–1
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–1	0–1
6	**Native summer annual grasses**			0–350	
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–215	0–25
	sixweeks threeawn	ARAD	*Aristida adscensionis*	0–135	0–2
	needle grama	BOAR	*Bouteloua aristidoides*	0–1	0–1
7	**Non-native annual grasses**			0–25	
	red brome	BRRU2	*Bromus rubens*	0–25	0–20
Forb					
3	**Native perennial forbs**			55–100	
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	0–44	0–2
	desert trumpet	ERIN4	*Eriogonum inflatum*	1–12	0–2
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	0–2	0–2
	whitestem paperflower	PSCO2	*Psilostrophe cooperi*	0–1	0–1
4	**Native anual forbs**			0–10	
	Indian rushpea	HOGL2	*Hoffmannseggia glauca*	0–10	0–1
	largebract spiderling	BOWR	*Boerhavia wrightii*	0–9	0–3
	fringed amaranth	AMFI	*Amaranthus fimbriatus*	0–5	0–2
	slender spiderling	BOTR	*Boerhavia triquetra*	0–1	0–1
	whitemargin sandmat	CHAL11	*Chamaesyce albomarginata*	0–1	0–1
	New Mexico thistle	CINE	*Cirsium neomexicanum*	0–1	0–1
	miniature woollystar	ERDI2	*Eriastrum diffusum*	0–1	0–1
5	**Non-native annual forbs**			0–10	
	redstem stork's bill	ERCI6	*Erodium cicutarium*	0–10	0–5
Tree					
8	**Arborescent monocot**			0–20	
	Jaeger's Joshua tree	YUBRJ	*Yucca brevifolia var. jaegeriana*	0–20	0–1

Animal community

Blackbrush communities with a perennial grass community are preferred habitat for bighorn sheep (Williams, 2000). Big galleta is also used by mule deer.

Big galleta is a valuable forage plant for livestock, and is especially palatable after summer rains (Williams, 2000). Declines in big galleta were observed with grazing in burned Utah blackbrush communities (Hughes, 2002), and in intact creosote bush communities in Arizona (Hughes, 1982). Declines in both communities occurred regardless of grazing management system, and are likely due to heavy utilization during periods of drought (Hughes, 1982).

Black grama is considered excellent forage for livestock and wildlife (Simonin, 2000). Black grama is tolerant of

light grazing, but is generally a decreaser under grazing, and is especially susceptible to damage during summer grazing (Simonin, 2000). Vegetative growth is suppressed with trampling, which can reduce black grama cover and vigor (Simonin, 2000).

Recreational uses

This site is used for hiking and aesthetic enjoyment.

Inventory data references

High intensity sampling (Caudle et al. 2013) was used to describe this ecological site. Site characteristics such as aspect, slope, elevation and UTMS were recorded for each plot, along with complete species inventory by ocular percent cover. The line-point intercept method was used to measure foliar cover, groundcover, and vegetation structure. At 100 points along a 400-foot step transect, ground cover and intercepted plant species were recorded by height. The first hit method (Herrick et al. 2009) was used to generate the foliar cover values entered in the community phase composition tables. Annual production was estimated using the double-weight sampling method outlined in the National Range and Pasture Handbook and in Sampling Vegetation Attributes (NRCS 2003 and Interagency Technical Reference 1999 pgs. 102 - 115). For herbaceous vegetation, ten 9.6 square foot circular sub-plots were evenly distributed along a 200 foot transect. For woody and larger herbaceous species production was estimated in four 21'X21' square plots along the same transect. Weight units were collected for each species encountered in the production plots. The number of weight units for each species is then estimated for all plots.

Community phase 3.1
2012CA795256
11CA795109
11CA795241

Community phase 3.2
2011CA795010 (Ocular cover only)

Type locality

Location 1: San Bernardino County, CA	
Township/Range/Section	T14N R16E S4
UTM zone	N
UTM northing	657468
UTM easting	3909552
General legal description	Approximately 1.35 miles inside the Mojave National Preserve Boundary on Ivanpah Road, and 0.3 miles @ 57 degrees from Ivanpah Road.

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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)	Dustin Detweiler
Contact for lead author	Dustin Detweiler
Date	12/17/2014
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:** None.

3. **Number and height of erosional pedestals or terracettes:** None.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground can range from 1 to 10%. Soil surface at this site is well protected by high gravel and plant cover.

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):** Due to the dense vegetation cover, litter does not move very far. At most fine litter may be able to move a couple feet in the spaces between plants. Very little medium sized woody litter is produced at this site.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Much of the soil surface at this site is protected by plants and gravel. Very little soil surface is exposed.

Exposed soil surface areas typically are single grained with a stability value of 0. Some areas under plants can have a stability value of 4.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is weak fine subangular blocky structure to weak medium subangular blocky structure. There is less than 0.75% organic matter. The A-horizon is yellowish brown to brown and 2 to 6 inches thick.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Native perennial grass cover reduces raindrop effective energy, increases infiltration and reduces runoff. Reduction in perennial grass cover may increase runoff and reduce the available soil moisture.

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

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Native perennial grasses > native summer annual grasses

    Sub-dominant: Native perennial forbs > native shrubs

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Some Joshua trees show decadence in response to periodic drought. Some native perennial shrubs increase with grazing and can be expected to show some mortality with rest from grazing. Other native perennial shrubs such as cacti can show moderate mortality rates following periodic drought.

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14. **Average percent litter cover (%) and depth (in):** Litter cover ranges from 1 to 10% cover and is usually a single piece of plant debris.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production can range from 670 to 1255 lbs/acre (based on community phase 3.1 as a representative community phase is not known to exist). Timing, amount and spatial heterogeneity of late summer rains greatly influence summer annual growth.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if**

their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: Redstem stork's bill and red brome can be found at this site but are unlikely to become co-dominants.

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17. **Perennial plant reproductive capability:** Native perennial grasses are able to quickly take advantage of late summer rains to produce a moderate amount of seeds. Shrub seedling establishment is probably minimal due to periodic hot/dry conditions and rodent herbivory.
