USDA Natural Resources
Conservation Service

Ecological site R030XC238CA
Bi-Modal Semi-Desert Deep Fans 8-10 inches

Last updated: 2/25/2025
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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

MLRA Description:

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. Elevations within the MLRA range from basin floors below sea level to mountains over 12,000 feet (3650 meters) high. The climate of the area is hot and dry with mostly hyperthermic and thermic soil temperature regimes and aridic soil moisture regimes. However, at higher elevations of this MLRA, generally above 5,000 feet, soil temperature regimes can be mesic, cryic and frigid with xeric soil moisture regimes. 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.

Classification relationships

Class - 3 Xeromorphic Woodland, Scrub & Herb Vegetation Class

Subclass - 3.B Cool Semi-Desert Scrub & Grassland Subclass

Formation - 3.B.1 Cool Semi-Desert Scrub & Grassland Formation

Division - 3.B.1.Ne Western North American Cool Semi-Desert Scrub & Grassland Division

Macrogroup - 3.B.1.Ne.1 Chrysothamnus viscidiflorus - Coleogyne ramosissima / Achnatherum hymenoides Great Basin & Intermountain Dry Shrubland & Grassland Macrogroup

Group - 3.B.1.Ne.1.a *Yucca brevifolia* - Eriogonum fasciculatum - Ephedra fasciculata Mixed Desert Scrub Group

Alliance - 3.B.1.Ne.1.a Coleogyne ramosissima Mojave Desert Shrubland Alliance

(Schulz 2014)

Ecological site concept

This ecological site occurs on fan remnants and fan aprons and the concave areas within these landforms (inset fans) in the upper fan piedmont. Soils have a xeric-aridic soil moisture regime (sometimes designated as ustic-aridic), and a cool thermic soil temperature regime. Soils are very deep, with a sandy particle size control section. This site receives additional run-on from adjacent mountains. The reference plant community is dominated by blackbrush (Coleogyne ramosissima). Joshua Tree (*Yucca brevifolia* var. jaegeriana) is an emergent canopy species at 1-3 percent cover. Surface flooding is generally not intense or frequent enough that it removes blackbrush, but can influence plant diversity. However, rare large flood events have the potential to alter the states and community phases of the ecological site.

This is a group concept and provisional STM that also covers the following ecological sites: R030XB014NV, R030XB090NV, R030XC001CA

Associated sites

R030XC007NV	**SHALLOW GRAVELLY LOAM 7-9 P.Z.** R030XC007NV is found very close to the mountain fronts where soils are often very shallow to shallow to bedrock or a petrocalcic horizon.
R030XC232CA	**Petrocalcic Fan Remnants** R030XC232CA soils are predominantly derived from alluvium from limestone and/or volcanic sources.
R030XC236CA	**Lithic Slopes** R030XC236CA is found on nearby low hills and ballenas with slopes generally greater than 15% slope.
R030XY219CA	**Ustic Ephemeral Drainageway Order 3** R030XY219CA is an ephemeral wash with a Strahler stream order between 2 and 3. This ecological site drains the upper fan piedmont areas and landforms with an ustic-aridic soil moisture regime.
R030XY222CA	**Typic Aridic Ephemeral Drainageway Order 3 4-7" p.z.** R030XY222CA is an ephemeral wash which typically drains landforms with a typic aridic (drier) soil moisture regime. Deep sandy soils at the lower elevations of map units with R030XC238CA often do not support the higher elevation species often found in R030XY219CA.

Similar sites

R030XB014NV	**SHALLOW GRAVELLY LOAM 7-9 P.Z.** R030XB014NV is a relic Range Site whose conceptual component has been included in Community Phase 2.1 of the R030XC238CA ecological site.
R030XB090NV	**GRAVELLY FAN 7-9 P.Z.** R030XB090NV is a relic Range Site whose conceptual component has been included in Community Phase 2.1 of the R030XC238CA ecological site.

Table 1. Dominant plant species

Tree	Not specified

Shrub	(1) *Coleogyne ramosissima*
Herbaceous	Not specified

Physiographic features

This ecological site occurs on fan remnants, fan aprons and inset fans on the upper fan piedmont.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Fan apron (3) Inset fan
Flooding frequency	Very rare to rare
Elevation	3,700–5,510 ft
Slope	2–15%

Climatic features

The climate of this ecological site is characterized by hot summers, cold winters, periodic drought, and a bimodal precipitation pattern. The temperature can fluctuate more than 25 degrees between night and day, especially during the transition from warm to cool seasons and vice versa. The sum of July, August and September rains typically exceed 2.5 inches which supports a suite of warm season plant species not common to the Mojave. The annual precipitation often exceeds 9 inches. Average minimum monthly air temperatures can be as low as 37 degrees F in winter months with average maximum monthly air temperatures as high as 94 degrees F in July. Mean annual temperature is about 60 degrees F.

Table 3. Representative climatic features

Frost-free period (average)	251 days
Freeze-free period (average)	305 days
Precipitation total (average)	10 in

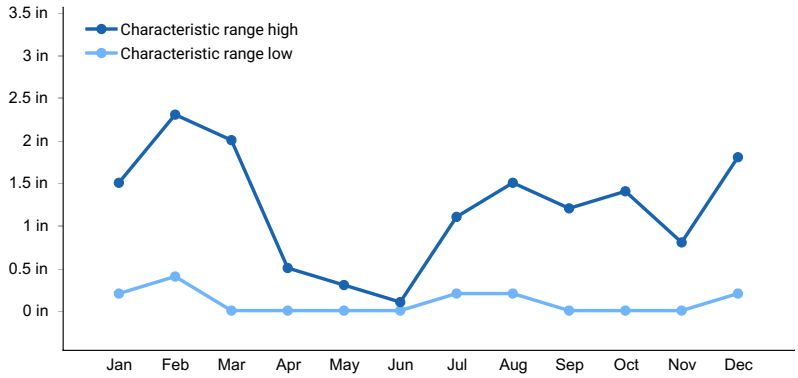


Figure 1. Monthly precipitation range

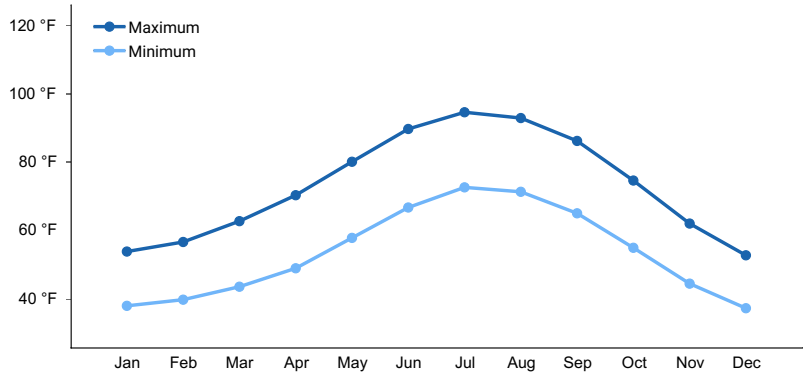


Figure 2. Monthly average minimum and maximum temperature

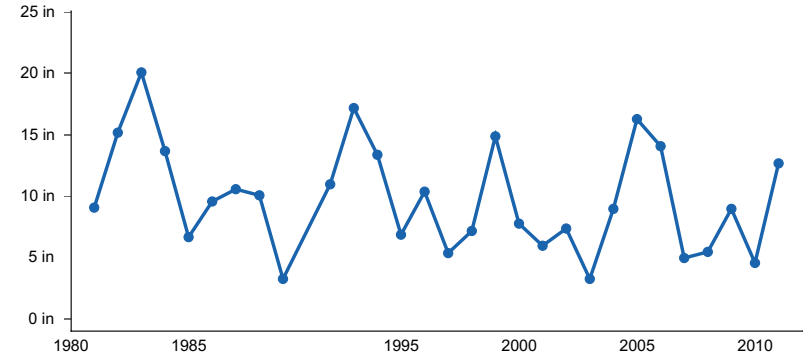


Figure 3. Annual precipitation pattern

Climate stations used

- (1) MITCHELL CAVERNS [USC00045721], Baker, CA
- (2) SEARCHLIGHT [USC00267369], Searchlight, NV

Influencing water features

None

Soil features

The soils associated with this ecological site are moderately deep to very deep. These soils formed in alluvium derived from granitic parent material and have a fine-loamy to sandy particle size control section. The soil temperature regimes are cool thermic with mean annual soil temperatures between 15 and 19 degrees C (59 to 66 degrees F). These soils have an aridic soil moisture regime which is borderline ustic or xeric. Although soils tend to be very deep, argillic soil horizons tend to keep moisture close to the surface. In some instances an abrupt textural change in poorly developed soils can act similar to soils with an argillic horizon.

This ecological site is correlated with the following soil survey area, map units and soil components (Area_sym; Musym; MUname; Compname; Local_phase; Comp_pct):

CA795; 205; Grottohill sandy loam, 2 to 8 percent slopes; Grottohill; 85
CA795; 212; Vontrigger sandy loam, 1 to 8 percent slopes; Vontrigger; 85
CA795; 370; Boomerang-Devamine complex, 2 to 15 percent slopes; Boomerang; 55; Devamine; 40
CA795; 371; Devamine loamy coarse sand, 2 to 8 percent slopes - overburden; Devamine; overburden; 85
CA795; 4220; Minehart gravelly fine sandy loam, 2 to 8 percent slopes; Minehart; 85
CA795; 4310; Fairlan sandy loam, 2 to 8 percent slopes; Fairlan; 85

Table 4. Representative soil features

Parent material	(1) Alluvium–granite

Surface texture	(1) Gravelly sandy loam (2) Gravelly fine sandy loam (3) Loamy coarse sand
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Very slow to rapid
Soil depth	60 in
Surface fragment cover <=3"	15–75%
Surface fragment cover >3"	0–10%
Available water capacity (0-40in)	1.6–6.9 in
Calcium carbonate equivalent (0-40in)	0–1%
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)	5–20%
Subsurface fragment volume >3" (Depth not specified)	0–3%

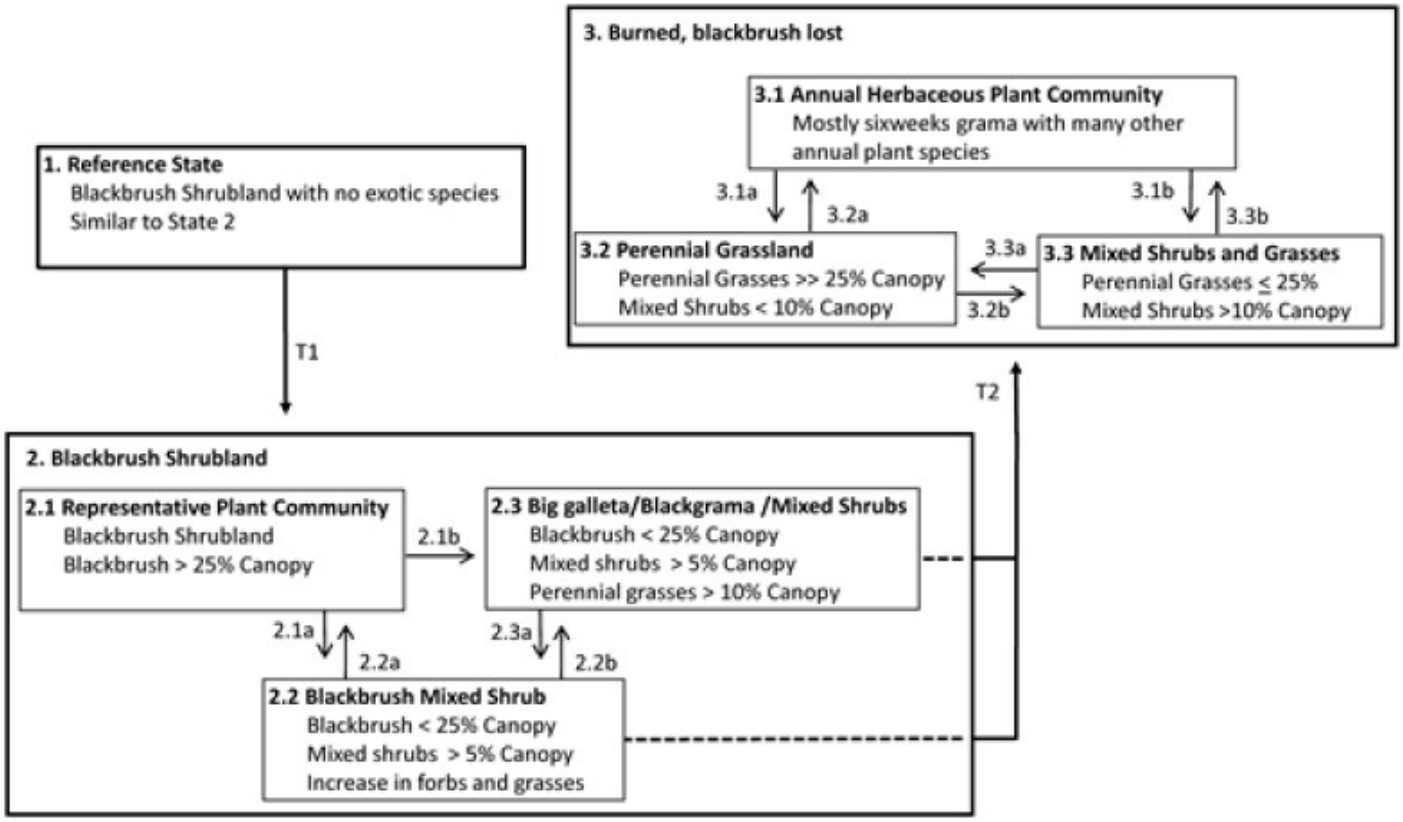
Ecological dynamics

Areas which have been dissected and removed from alluvial fan formation processes tend to produce blackbrush stands with few yucca and cacti species present. Joshua Tree (*Yucca brevifolia* var. jaegeriana) is often a visually dominant species but rarely contributes significant cover or annual production for the site. Portions of the alluvial fan where soil surface material is removed from the site tend to have a greater shrub diversity with an increase in pioneering shrubs such as burrobush (*Hymenoclea salsola*) and purple sage (*Salvia dorrii*). Lower portions of these fans where sedimentary material accumulates (also called overburden) tend to have an increase in perennial grass cover such as black grama (*Bouteloua eriopoda*) and big galleta (*Pleuraphis rigida*) as well as having greater shrub diversity.

This ecological site and the surrounding areas can experience intense lightning storms with lightning fires (Papierski 1993). Due to the close proximity of the surrounding mountains, burned mountain slopes can be one of the greatest forces driving the ecological dynamics of this site. Although the cooler moist climatic factors can facilitate post-disturbance blackbrush recovery when a nearby seed source is available, many areas of this ecological are not likely to experience blackbrush reestablishment after an event has removed it often due to increase surface flow following a fire. In these cases, frequent flooding disturbance tends to maintain a plant community devoid of blackbrush.

Some areas of this ecological site are devoid of Joshua trees which could be the result of several factors. The cooler and moister climate may prevent Joshua tree seedling survival, either because winter temperatures are too cold, the soils are too damp, or there may be a higher competitive advantage for black brush in these areas which prevents Joshua trees recruitment. Blackbrush is often a nurse plant for Joshua trees and in areas where blackbrush rarely experiences drought deciduous behavior may prevent Joshua trees from getting the full sunlight they need during the summer (Brittingham and Walker 2000; Cole et. Al 2011; Hickman 1993). Additionally, early settlers intentionally removed Joshua trees for steam engine fuel, fences and corrals (Rodgers 2015).

State and transition model



State 1
Reference State

The community phase pathways for this state were probably similar to State 2. The only difference between States 1 and 2 is the assumption that non-native species were absent from State 1. The widespread presence of non-native annual species makes a reference state devoid of these species unrealistic. Although some areas, at times may seem to be in reference condition, non-native annuals are likely to be present at some times of year and/or following certain years with the proper combination of precipitation amounts, timing and temperatures.

State 2
Blackbrush Shrubland

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 a minimum, sparsely present. Non-native annuals may be present in current year's growth or in the soil seedbank. This ecological state has a long history of livestock grazing which is likely to have obscured our understanding of state and community pathways as well as vegetation composition. Given that this ecological site generally lies at the base of mountains, at higher elevations and can support perennial bunch grasses, unlike the more harsh and arid Mojave Desert environments, this ecological site would have been attractive to early livestock operations in the Mojave Desert.

Community 2.1
Representative plant community

Figure 5. Representative Plant Community

Figure 6. Representative Plant Community with few Joshua trees

This monospecific blackbrush stand often exists with few other species scattered throughout the stand and under blackbrush canopies. Blackbrush as a climax species is supported by West (1969), Provenza and Urness (1981) and Jeffries and Klopatek (1987) but solid stands may have developed as livestock grazing removed more palatable grasses and shrubs (Bowns and West 1976b, Plummer et. al 1968).

Table 5. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	0%
Forb basal cover	0%
Non-vascular plants	0%
Biological crusts	0-8%
Litter	15-45%
Surface fragments >0.25" and <=3"	20-45%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	20-40%

Community 2.2
Blackbrush Mixed Shrub

Figure 8. Blackbrush Mixed Shrub

Response to fire is unpredictable and can vary greatly depending on the climatic conditions at the time of fire, dynamic soil properties as well as varying land uses pre and post-fire (Bowns and West 1976a). The overall response is decreased blackbrush cover and an increase in mixed shrub and herbaceous cover. Grazing this community phase will tend to maintain a mixed shrub cover by removing the more palatable grasses. Shrub dominance may also indicate an older burn, greater than 15 years (Bates 1983, Callison et. al 1985). These low intensity burns may also increase the number of individual Joshua trees which have been reported to sprout vigorously post fire (Gorder et al. 2005). This is an at risk community phase. The loss of blackbrush cover allows interspaces to become occupied by a more continuous plant cover which can help spread fire (D'Antonio and Vitousek 1992, Brooks and Matchett 2003, Brooks et al. 2004, Brooks and Matchett 2006). If the fire return interval is less than 100 years, this community is very likely to transition to State 3.

Community 2.3
Big galleta/Blackgrama /Mixed Shrubs

Figure 9. Big galleta/Blackgrama /Mixed Shrubs

Response to fire is unpredictable and can vary greatly depending on the climatic conditions at the time of fire, dynamic soil properties as well as varying land uses pre and post-fire (Bowns and West 1976a). The overall response is decreased blackbrush cover and an increase in mixed shrub and herbaceous cover. These low intensity burns may also increase the number of individual Joshua trees which have been reported to sprout vigorously post fire (Gorder et al. 2005). Grazing this community phase will tend to maintain a mixed shrub cover; however active sedimentary deposition or overburden will favor grasses. Grass dominance may also indicate a middle aged burn (> one year and < 15 years) while older fires are likely to be dominated by shrubs (Callison et. al 1985). This is also an at risk community phase. The loss of blackbrush cover allows interspaces to become occupied by a more continuous herbaceous and shrub cover which can help spread fire (D'Antonio and Vitousek 1992, Brooks and Matchett 2003, Brooks et al. 2004, Brooks and Matchett 2006). If the fire return interval is less than 100 years, this community is very likely to transition to State 3.

Pathway 1a
Community 2.1 to 2.2

Representative plant community

Blackbrush Mixed Shrub

Occurs with low intensity, patchy fire or other forms of patchy blackbrush removal such as heavy grazing and an increase in flooding frequency.

Pathway 1b
Community 2.1 to 2.3

Representative plant community

Big galleta/Blackgrama /Mixed Shrubs

Occurs with low intensity, patchy fire or other forms of patchy blackbrush removal such as heavy grazing and an increase in flooding frequency. Additionally, fire in the upslope areas accelerates soil removal, leading to soil deposition at this ecological site.

Pathway 2a
Community 2.2 to 2.1

Blackbrush Mixed Shrub

Representative plant community

Over time (>20 years), absent the disturbance which removed blackbrush, with the occurrence of mast seed crops followed by favorable climatic conditions, monospecific stands of blackbrush may dominate the landscape. Moderate to heavy winter precipitation is likely to favor mast seed production (Beatley 1974). Livestock grazing may accelerate this transition by removing herbaceous competition (Jeffries and Klopatek 1987).

Pathway 2b
Community 2.2 to 2.3

Blackbrush Mixed Shrub

Big galleta/Blackgrama /Mixed Shrubs

Occurs when fire in the upslope areas accelerates soil removal, leading to soil deposition at this ecological site. Livestock grazing and localized low intensity fire may also contribute to a reduction in blackbrush cover.

Pathway 3a
Community 2.3 to 2.2

Big galleta/Blackgrama /Mixed Shrubs

Blackbrush Mixed Shrub

Occurs as the overburden is either removed or the rate of sedimentary deposition greatly decreases.

State 3
Burned, blackbrush lost

This state exists when blackbrush is lost from the community as a result of large-scale and high intensity fires, where blackbrush seed source is not available to recolonize, and/or recurrent fire does not provide intervals long enough for blackbrush recovery. Evidence suggests that Indigenous land management practices were employed in and around this ecological site for several reasons, which include increasing the number of individual Mojave yucca (*Yucca schidigera*) and banana yucca (*Yucca baccata*) plants. Several bands of Chemehuevi (Hokwaits, Kauyaichits, and the Timpashauwagotsits) spent time in and around the Providence and New York Mountains and are reported to have employed fire as a hunting technique to capture rabbits and deer (Miller and Miller 1967). Laird (1984) also describes Chemehuevi tales where fire was used to improve the growth and quality of basketry materials as well as to char seeds to be eaten. Whether intentional or not, the greatest differences recorded between pre- and post-fire vegetation demographics, aside from the blackbrush removal, is an increase in *Yucca schidigera* and *Yucca baccata* individuals. S.R. Abella (2009) found Mojave yucca (*Yucca schidigera*) to exhibit the highest post-fire sprouting rate than any other plant species in a study of post-fire recovery in the Mojave and Sonoran Deserts. Abella et al (2009) also described vigorous *Yucca baccata* and schidigera resprouting following a Mojave Desert burn. In yet another study of post-fire effects, a similar yucca (*Yucca glauca*) increased the number of rosettes, from pre-burn, by 17% two years following the experimental fire (Parmenter 2008). Many tribes such as the Chemehuevi used Yucca species for food, soap, baskets, bowstrings, sandals and many other items (Bean and Saubel 1972).

Community 3.1
Annual Herbaceous Plant Community

This community phase is dominated by annual grasses and forbs. This community phase could last for 2 to 3 years following fire depending on the intensity of the fire, the extent of the fire, weather conditions following the fire and the elevation of the fire (Bates 1983). This community phase could be short lived at this ecological site's highest elevations and may persist for longer periods at the lower elevations.

Community 3.2
Perennial Grassland

Figure 10. Perennial Grassland

Although perennial grasses dominate this community phase, shrubs can be relatively abundant. This community

phase, especially following favorable climatic conditions, is susceptible to repeated burning.

Community 3.3
Mixed Shrubs and Grasses

Figure 11. Mixed shrub and grasses

Although shrubs dominate this site, perennials grasses may be relatively abundant. Heavy grazing and drought will reduce perennial grass cover and maintain a mixed shrub plant community. For these reasons, southwardly facing and slightly drier areas will tend to have more shrubs while northwardly facing and moister areas tend to have more grasses.

Pathway 1a
Community 3.1 to 3.2

With 10-15 years following fire, perennial grasses and shrubs will become established (Bates 1983). Perennial grasses will dominate sites with active overburden or sediment deposition.

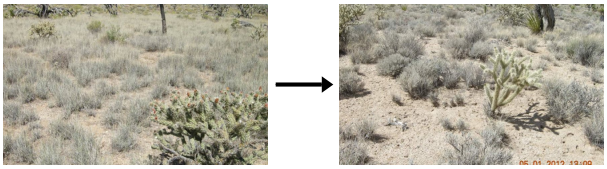
Pathway 1b
Community 3.1 to 3.3

With 25-20 years following fire, shrubs are likely to dominate the sites (Bates 1983). Shrubs may dominate sooner than 25-30 years if the site is not experiencing active overburden.

Pathway 2a
Community 3.2 to 3.1

A high intensity fire will return this community phase to an annual herbaceous plant community.

Pathway 2b
Community 3.2 to 3.3



Perennial Grassland **Mixed Shrubs and Grasses**

With time, shrubs stabilize the soil surface and allow shrub islands to develop, eventually dominating the site (Bates 1983). Heavy livestock grazing will reduce big galleta and black grama cover (Nelson 1934, Canfield 1939, Miller and Donart 1979, Hughes 1982). Shrub dominance can be merely by grass removal but also by reduced competition from the grasses. Another mechanism which triggers this pathway is severe drought. Black grama cover is reduced by drought (Gibbens and Beck 1988). The combination of repeated burns and grazing may effectively increase soil temperature producing a localized drought which excludes or reduces black grama cover

(Vermeire et al. 2005).

Pathway 3b
Community 3.3 to 3.1

A high intensity fire will return this community phase to an annual herbaceous plant community.

Pathway 3a
Community 3.3 to 3.2

Mixed Shrubs and Grasses **Perennial Grassland**

Rest from livestock grazing can increase perennial grass cover in less than 15 years (Hughes 1990, Parmenter 2008.). Drought will limit the ability of this community phase pathway to occur. Ranges where black grama have been depleted have little chance for black grama restoration (Nelson 1934). Shrub control is likely necessary to convert and maintain at least a semi-grassland community (Gibbens et al. 2005). Another mechanism triggering this community phase pathway is low intensity fire or fires upslope producing active sediment deposition or overburden.

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 makes their eradication nearly impossible.

Transition 2
State 2 to 3

This transition occurs when conditions create a large-scale, high intensity and/or recurrent fires. The combination of a lack of nearby seed sources and localized site warming due to reduced plant cover makes restoration to state 2 conditions very difficult, especially at the lower elevations of this ecological site.

Additional community tables

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Tree					
1	**Trees**			0–10	
	catclaw acacia	SEGR4	*Senegalia greggii*	0–10	0–5
	Jaeger's Joshua tree	YUBRJ	*Yucca brevifolia var. jaegeriana*	0–10	0–5
Shrub/Vine					
2	**Shrubs**			200–350	
	blackbrush	CORA	*Coleogyne ramosissima*	200–250	25–45
	burrobrush	HYSA	*Hymenoclea salsola*	0–70	0–5
	turpentinebroom	THMO	*Thamnosma montana*	0–50	0–3
	Nevada jointfir	EPNE	*Ephedra nevadensis*	5–40	1–5
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	0–30	0–1
	Mojave yucca	YUSC2	*Yucca schidigera*	0–20	0–1
	Mexican bladdersage	SAME	*Salazaria mexicana*	0–15	0–1
	banana yucca	YUBA	*Yucca baccata*	1–10	1–3
	Cooper's goldenbush	ERCO23	*Ericameria cooperi*	0–10	0–1
	buck-horn cholla	CYAC8	*Cylindropuntia acanthocarpa*	0–10	0–1
	branched pencil cholla	CYRA9	*Cylindropuntia ramosissima*	0–5	0–3
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	0–5	0–1
	grizzlybear pricklypear	OPPOE	*Opuntia polyacantha var. erinacea*	0–5	0–1
	Mojave cottonthorn	TEST2	*Tetradymia stenolepis*	0–5	0–1
Grass/Grasslike					
3	**Warm season grasses**			0–2	
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–1	0–10
	needle grama	BOAR	*Bouteloua aristidoides*	0–1	0–5
4	**Cool season grasses**			0–10	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–10	0–1
7	**Non-native grasses**			0–1	
	red brome	BRRU2	*Bromus rubens*	0–1	0–5
Forb					
5	**Native forbs**			0–1	
	fringed amaranth	AMFI	*Amaranthus fimbriatus*	0–1	0–2
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	0–1	0–2
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	0–1	0–2
	phacelia	PHACE	*Phacelia*	0–1	0–1
6	**Non-native forbs**			0–1	
	redstem stork's bill	ERCI6	*Erodium cicutarium*	0–1	0–1

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 either 300 or 100 points along a 600- or 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 2003 National Range and Pasture Handbook. 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.

Other references

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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	07/20/2012
Approved by	Sarah Quistberg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are none to rare. A few rills can be expected on steeper slopes in areas recently subjected to summer convection storms.

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2. **Presence of water flow patterns:** Water flow patterns are none to rare but can be expected in areas recently subjected to summer convection storms, usually on steeper slopes. These are short (<1m) and not connected.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare. Occurrence is usually limited to areas of water flow patterns.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground 15-20%; surface cover of rock fragments are variable but are usually more than 70%; shrub canopy to 25%.

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

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

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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 (<10 ft) during intense summer convection storms or rapid snowmelt events. Persistent litter (large woody material) will remain in place except during rainfall events.

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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 3 to 6 on most soil textures found on this site. (To be field tested.)

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically moderate medium and thick platy to weak fine subangular blocky. Soil surface colors are grays and soils typically have an ochric epipedon. Organic matter of the surface horizon is typically less than 1 percent dropping off quickly below. Organic matter content can be more or less depending on micro-topography.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Shrub canopy and associated litter provide some protection from raindrop impact.

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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. Subsoil argillic horizons are not to be interpreted as compacted.

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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: Mojave Desert shrubs

    Sub-dominant: warm-season, perennial bunchgrasses > cool-season, perennial bunchgrasses > perennial forbs > annual grasses = annual forbs

    Other:

    Additional:

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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 25% of total woody canopy; some of the mature bunchgrasses (<10%) have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Up to 30% < ¼ inch in depth

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season ± 500 lbs/ac. Favorable years ± 700 lbs/ac and unfavorable years ±250 lbs/ac

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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: Potential invaders on this site include red brome, redstem filaree, annual mustards, and Mediterranean grass.

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17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years. Little growth occurs during extreme drought years or extended drought.
