# Ecological site R030XC235CA
# Limestone Fan Remnants (Provisional)

Last updated: 2/25/2025
Accessed: 05/12/2025

## General information

**Provisional**. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

## MLRA notes

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

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. The climate of the area is hot and dry with mostly hyperthermic and thermic soil temperature regimes. However, at higher elevations of this MLRA, generally above 5,000 feet, soil temperature regimes can be mesic, cryic and frigid. The most arid regimes of this MLRA can receive less than 4 inches (100 mm) Elevations range from below sea level to over 12,000 feet (3650 meters) 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.

## Classification relationships

Juniperus osteosperma Woodland Alliance (Sawyer et al. 2009).

## Ecological site concept

This ecological site occurs on gently sloping alluvial fan remnants and hillslopes at elevations between approximately 4600 to 5300 feet and slopes ranging from 2 to 8 percent. Mean annual precipitation ranges from 7 to 9 inches and the soil moisture regime is aridic bordering on ustic. Soils are moderately deep to a petrocalcic horizon and formed in alluvium from predominately limestone parent material. Soils have a coarse-loamy particle size class. Reference plants include Utah juniper (Juniperus osteosperma), blackbrush (Coleogyne ramosissima), black grama (Bouteloua eriopoda) and big galleta (Pleuraphis rigida). Much of the extent of this ecological site exists in an altered state where blackbrush has been lost. Production reference value (RV) is 600 pounds per acre. This site occurs in the narrow elevation band in the eastern Mojave Desert where Utah juniper dominates over pinyon pine (Sawyer et al. 2009). High summer precipitation supports black grama. This site is in a transitional area between thermic to mesic soil temperature regimes, which supports a mixture of warm and cool desert species.

This site is part of group concept R030XC041NV.

## Associated sites

| | |
|---|---|
| R030XY219CA | **Ustic Ephemeral Drainageway Order 3**<br>This site occurs on adjacent large ephemeral drainageways. Desert willow (Chilopsis linearis) and Mojave rabbitbrush (Ericameria paniculata) are important species. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | (1) *Juniperus osteosperma* |
| Herbaceous | (1) *Bouteloua eriopoda*<br>(2) *Pleuraphis rigida* |

## Physiographic features

This ecological site is found on summits and backslopes of fan remnants with slopes of 2 to 8 percent at elevations between 4630 and 5250 feet. This site is often dissected by small, frequently flooded drainageways. Runoff class is very low to low.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Fan remnant |
| Flooding frequency | None |
| Elevation | 1,411–1,600 m |
| Slope | 2–8% |
| Aspect | Aspect is not a significant factor |

## Climatic features

## Influencing water features

## Soil features

The soils associated with this ecological site formed in alluvium from limestone sources. Soils are very deep or moderately deep to a petrocalcic horizon. Soils have a thermic temperature regime and a typic aridic bordering on ustic soil moisture regime. Surface textures are sandy loams and subsurface textures include sandy loam, gravelly sandy loam, coarse sand, and cemented loamy sand. Surface rock fragments less than 3 inches in diameter average 40 percent and larger fragments are typically not present. Subsurface fragments less than 3 inches in diameter range from 11 to 19 percent by volume and larger fragments are generally not present (for a depth up to 71 inches). The soil series that have been correlated with this site include Stonekey (Coarse-loamy, carbonatic, thermic Calcic Petrocalcids) and Rosshorse (Coarse-loamy, mixed, superactive, thermic Ustic Haplocalcids).

This ecological site has been correlated with the following mapunits and soil components in the Mojave National Preserve soil survey area (CA795):

4306 ; Stonekey-Rosshorse complex, 2 to 8 percent slopes ; Stonekey ; 65 ; Rosshorse ; 25

**Table 3. Representative soil features**

| | |
|---|---|
| Parent material | (1) Alluvium–limestone |
| Surface texture | (1) Sandy loam |
| Family particle size | (1) Loamy |
| Drainage class | Well drained |
| Permeability class | Moderately rapid |
| Soil depth | 64 cm |
| Surface fragment cover <=3" | 40% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-101.6cm) | 5.59–8.64 cm |
| Calcium carbonate equivalent (0-101.6cm) | 1–30% |
| Electrical conductivity (0-101.6cm) | 0–2 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0–4 |
| Soil reaction (1:1 water) (0-101.6cm) | 6.6–9 |
| Subsurface fragment volume <=3" (Depth not specified) | 11–19% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

## Ecological dynamics

Abiotic factors
This ecological site occurs on gently sloping alluvial fan remnants and hillslopes at elevations between approximately 4600 to 5300 feet and slopes ranging from 2 to 8 percent. Mean annual precipitation ranges from 7 to 9 inches and the soil moisture regime is aridic bordering on ustic. Soils are moderately deep to a petrocalcic horizon and formed in alluvium from predominately limestone parent material. Soils have a coarse-loamy particle size class. Reference plants include Utah juniper, blackbrush, black grama and big galleta. Much of the extent of this ecological site exists in an altered state where blackbrush has been lost. Production reference value (RV) is 600 pounds per acre. This site occurs in the narrow elevation band in the eastern Mojave Desert where Utah juniper dominates over pinyon pine (Sawyer et al. 2009). High summer precipitation supports black grama. This site is in a transitional area between thermic to mesic soil temperature regimes, which supports a mixture of warm and cool desert species.

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

Pre-European settlement fire return intervals for Utah juniper woodland in California are estimated at 100-200 years (Sawyer et al. 2009). Utah juniper is generally killed by even light fire, and mature woodlands of this very slow growing species can take 85 to 90 years to develop (Zlatnik 1999). The historic natural fire regime for blackbrush is 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, promoting diversity over a landscape scale.

The naturalization of non-native annual species such as red brome (*Bromus rubens*) and cheatgrass (*Bromus tectorum*) with European exploration and settlement from the 1860s through the 1900s (e.g. Brooks and Chambers 2011) caused a transition from the reference state with a long fire return interval and only native species, to a state that included non-natives and more frequent fire (State 2). Invasion by non-native annual grasses increases the flammability of this vegetation by providing a continuous fine fuel layer between trees and shrubs (e.g. Brown and Minnich 1986, 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). More frequent fires may be causing a reduction in the extent of Utah juniper woodlands in California (Sawyer et al. 2009). Although red brome is recorded in this site, abundant non-native grasses were not observed and an increase in perennial grasses after fire probably poses a higher risk for increased burning.

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 et al. 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 (Nystrom 2003).

Cattle grazing has influenced the community dynamics of this ecological site. 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 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) due to soil compaction, which increases bulk density and decreases pore space (e.g. Rauzi and Hanson 1966, Abdel-Magid et al. 1987). Grazing in juniper dominated communities can increase juniper dominance [MM1] (Zlatnik 1999). 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 species such as black grama to less palatable species such as purple needlegrass, and to species more tolerant of mechanical disturbance, or with a shorter life-cycle

All tabular data listed for a specific community phase within this ecological site description represent a summary of one or more field data collection plots taken in modal communities within the community phase. Although such data are valuable in understanding the phase (kinds and amounts of ground and surface materials, canopy characteristics, community phase overstory and understory species, production and composition, and growth), they do not represent the absolute range of characteristics or an exhaustive listing of all species that may occur in that phase over the geographic range of the ecological site.

## State and transition model

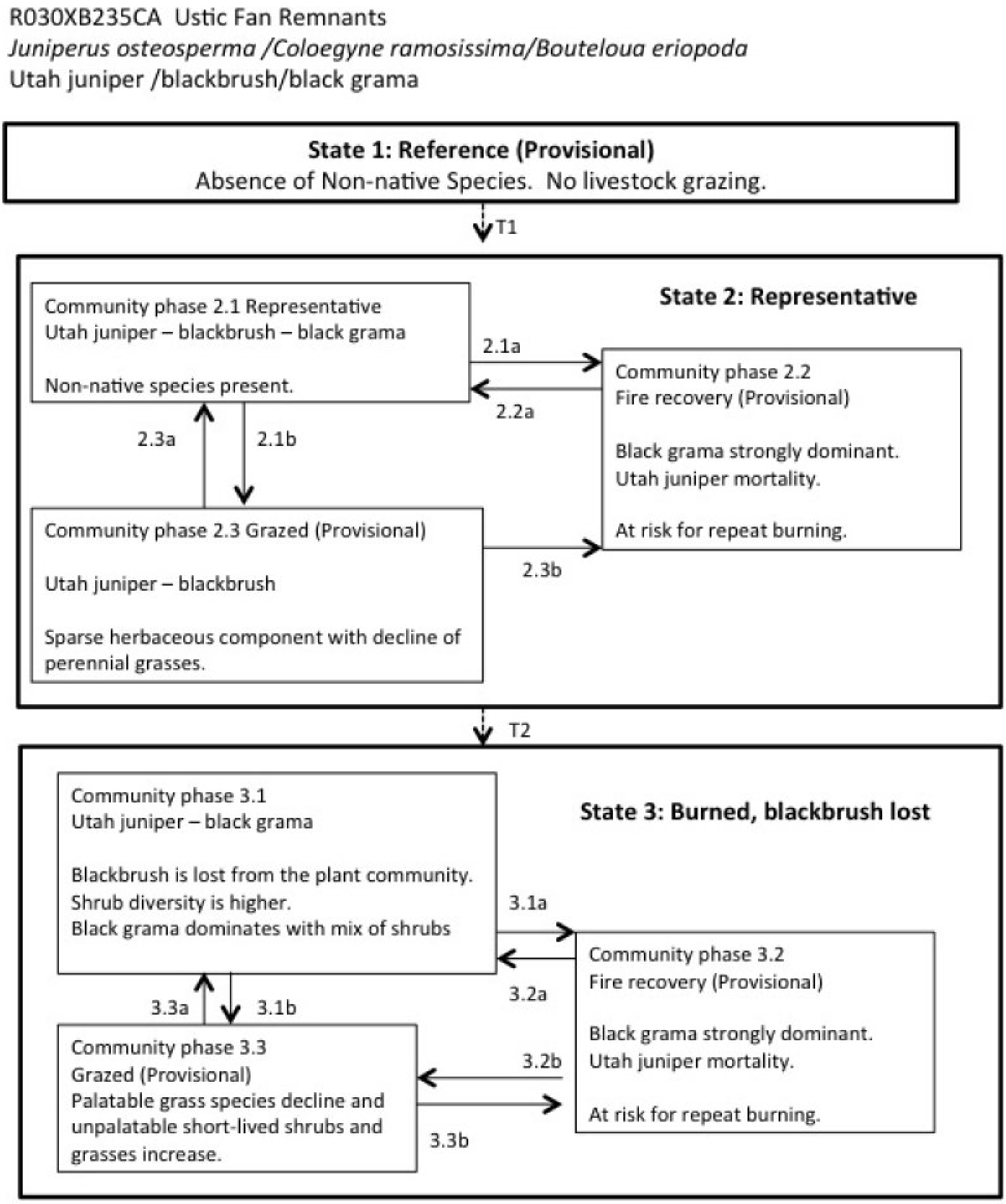


**Figure 1. R030XB235CA**

## State 1
## Reference (Provisional)

This state represents the natural range of variability for this ecological site, pre-European settlement. Data for this state does not currently exist, due to the naturalization of non-native species and 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). This state had infrequent fire, only native species, and no livestock grazing. Fluctuations in annual productivity would have occurred with climatic variability.

### State 2
### Representative

This is the representative state for this ecological site. It is similar in composition to the reference plant community, but non-native species are present. Utah juniper cover may be lower than in the reference state due to widespread cutting of Utah juniper to support mining and settlements in the area (Snorf 1991). Overall cover may be lower due to ubiquitous livestock grazing, and perennial grass cover may be lower than in the reference state.

### Community 2.1
### Representative community Utah juniper - blackbrush

**Figure 2. Community Phase 2.1**

The representative community phase is characterized by an overstory of Utah juniper and a shrub layer strongly dominated by blackbrush. Non-native species including red brome and red stem stork's bill are present. *Community composition data for this phase was not available at the time of writing, because much of this ecological site exists in a burned state (3), which has lost the blackbrush component. Waypoint 066 is thought to represent this phase.

### Community 2.2
### Fire Recovery (Provisional)

Perennial grasses, dominated by black grama and big galleta, characterize this plant community. The rate of recovery is 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. This phase is at risk for repeat burning due to increased fine fuels.

### Community 2.3
### Grazed (Provisional)

This plant community may develop with grazing. Significant declines in perennial grass density and cover, and a decrease in shrub cover characterize this community phase. Blackbrush is still strongly dominant, and Utah juniper may increase. Cryptobiotic crust cover declines. Reduced vegetation and crust cover with 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 since the perennial grass component, which recovers quickly and becomes dominant in the burned phase of the reference community is missing.

### Pathway 2.1a
### Community 2.1 to 2.2

Occurs with fire.

### Pathway 2.1b
### Community 2.1 to 2.3

May occur with grazing.

### Pathway 2.2a
### Community 2.2 to 2.1

Time without fire (100+ years) or other disturbance. This may occur more rapidly with low severity fire, and/or adequate blackbrush seed sources.

### Pathway 2.3a
### Community 2.3 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).

### Pathway 2.3b
### Community 2.3 to 2.2

Occurs with fire.

### State 3
### Burned, blackbrush lost

This state exists when 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. Much of the current extent of this ecological site is in this state.

### Community 3.1
### Utah juniper - black grama - big galleta

**Figure 3. Community Phase 3.1**

The representative plant community is dominated by Utah juniper, black grama and big galleta. Secondary perennial grasses include desert needlegrass (*Achnatherum speciosum*), Indian ricegrass (*Achnatherum hymenoides*), bush muhly (*Muhlenbergia porteri*), and purple needlegrass (Arisitida purpurea). Compared to the reference and representative communities, this phase has high shrub evenness, with no dominant shrub. The species composition reflects both lower elevation Mojave Desert shrublands and higher elevation desert mountains.

Winterfat (*Krascheninnikovia lanata*), Nevada jointfir (*Ephedra nevadensis*), littleleaf ratany (*Krameria erecta*) and banana yucca (*Yucca baccata*) are more abundant shrubs. Other shrubs may include Mexican bladdersage (*Salazaria mexicana*), slender buckwheat (*Eriogonum microthecum*), threadleaf snakeweed (*Gutierrezia microcephala*), desert polygala (*Polygala acanthoclada*), rayless goldenhead (*Acamptopappus sphaerocephalus*), purple sage (*Salvia dorrii*), and desert almond (*Prunus fasciculata*). Perennial forbs include desert trumpet (*Eriogonum inflatum*), whitestem paperflower (*Psilostrophe cooperi*), brownplumed wirelettuce (Stephanomaria pauciflora), desert marigold (*Baileya multiradiata*), rose heath (*Chaetopappa ericoides*), and Navajo fleabane (*Erigeron concinnus*). Annual forbs characteristic of dry rocky habitats of the eastern desert mountains are present, including plains flax (Linum puberulum), purple birds-beak (*Cordylanthus parviflorus*), and thymeleaf sandmat (*Chamaesyce serpyllifolia*). The non-native annual grass red brome is typically present in low amounts. In addition to Utah juniper, desert polygala, purple birds-beak, cold-desert phlox, squareseed spurge, and James' galleta are indicative of the more mesic desert mountain habitat, while other species are more typical of lower elevation fan piedmonts or are widespread in a range of habitats.

**Table 4. Annual production by plant type**

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|---|---|---|---|
| Grass/Grasslike | 252 | 303 | 353 |
| Shrub/Vine | 159 | 191 | 222 |
| Tree | 99 | 118 | 137 |
| Forb | 56 | 62 | 72 |
| **Total** | **566** | **674** | **784** |

**Table 5. Ground cover**

| | |
|---|---|
| Tree foliar cover | 4-6% |
| Shrub/vine/liana foliar cover | 11-16% |
| Grass/grasslike foliar cover | 18-23% |
| Forb foliar cover | 1-3% |
| Non-vascular plants | 0% |
| Biological crusts | 0% |
| Litter | 1-2% |
| Surface fragments >0.25" and <=3" | 15-24% |
| Surface fragments >3" | 1-3% |
| Bedrock | 0% |
| Water | 0% |
| Bare ground | 20-24% |

**Table 6. Canopy structure (% cover)**

| Height Above Ground (M) | Tree | Shrub/Vine | Grass/ Grasslike | Forb |
|---|---|---|---|---|
| <0.15 | – | 0-1% | 0-3% | 0-4% |
| >0.15 <= 0.3 | – | 1-3% | 0-7% | 0-5% |
| >0.3 <= 0.6 | 0-1% | 5-8% | 20-30% | 2-5% |
| >0.6 <= 1.4 | 1-4% | 4-7% | 0-5% | 0-1% |
| >1.4 <= 4 | 4-6% | 0-3% | – | – |
| >4 <= 12 | 0-6% | – | – | – |
| >12 <= 24 | – | – | – | – |
| >24 <= 37 | – | – | – | – |
| >37 | – | – | – | – |

### Community 3.2
### Fire Recovery (Provisional)

This community phase is characterized by increased grass cover and Utah juniper mortality. Initially after fire herbaceous species are strongly dominant. Black grama typically demonstrates rapid recovery after fire (Potter and Krenetsky 1967, Allred and Snyder 2008), although the rate of recovery will depend on the climatic conditions, with recovery slower if fire occurs during drought when perennial grasses are dormant, or if drought occurs after fire. Black grama had recovered to 51 percent of pre-fire patch size five years after fire, and was projected to fully recover within 12 years in a Chihuahuan Desert grassland (Parmenter 2008). Big galleta may also increase in abundance post-fire. If big galleta was burned when it was green (which would typically be the case during the summer monsoon season), it would quickly resprout and become abundant (Matthews 2000, Minnich 2003). However, if big galleta is dormant when burned it may be killed by a hot fire (Matthews 2000). With time, perennial forbs and shrubs capable of re-sprouting after fire, or of quickly colonizing disturbed areas will increase. Species likely to resprout include banana yucca, Nevada jointfir, desert almond, Mexican bladdersage and purple sage. Species likely to re-establish from seed include desert globemallow, brownplumed wirelettuce, whitestem paperflower, threadleaf snakeweed, rose heath, desert marigold, and rayless goldenhead. Higher grass cover in this phase makes it susceptible to repeat burning, which would perpetuate this phase. Data is not available to indicate such frequent burning that a new grassland phase is triggered, but there is potential for this transition (e.g. Sawyer et al. 2009).

### Community 3.3
### Grazed (Provisional)

This phase may develop with sustained grazing, especially at higher utilization levels. Black grama may decline with heavy grazing (e.g. Yao et al. 2006, Allred and Snyder 2008, Havstad and James 2010), and especially with grazing during drought or during the summer growing season. Black grama cover may increase rapidly with protection from grazing (Potter and Krenetsky 1967, Woodmansee and Potter 1971). Purple threeawn is an increaser with grazing (Canfield 1948, Howard 1997). Threeawns likely to be abundant in early years after grazing because they colonize disturbed soils quickly (Howard 1997). On a Texas mesa protected from grazing, black grama increased but purple threeawn was still abundant after five years. After 25 years recovery purple threeawn declined by 50 percent. Declines in grass cover can lead to an increase in Utah juniper cover, and once trees are established their utilization of soil moisture can prevent grass establishment, causing a positive feedback that maintains higher Utah juniper cover (Zlatnik 1999). This phase is unlikely to return to the representative community with only the cessation of grazing. Manual thinning of Utah juniper or fire is necessary to reduce tree cover so that grasses can re-establish.

### Pathway 3.1a
### Community 3.1 to 3.2

This pathway occurs with fire. Even light to moderate fire can kill Utah juniper and lead to a new community phase.

### Pathway 3.1b
### Community 3.1 to 3.3

May occur with grazing, especially at higher utilization levels.

### Pathway 3.2a
### Community 3.2 to 3.1

Occurs with time and a lack of further disturbance such as burning or grazing. Recovery may take 90 or more years (Sawyer et al. 2009).

### Pathway 3.2b
### Community 3.2 to 3.3

May occur with grazing. Grazing may promote tree recovery by reducing grass competition.

### Pathway 3.3a
### Community 3.3 to 3.2

This pathway occurs with fire. Even light to moderate fire can kill Utah juniper and lead to a new community phase.

### Transition T1
### State 1 to 2

This transition occurred with naturalization of non-native annual species such as red brome, cheatgrass, and redstem storks bill, and the introduction of livestock grazing 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 and returning to the reference state is not possible.

### Transition T2
### State 2 to 3

This transition may occur with large-scale severe or recurrent fire.

## Additional community tables

**Table 7. Community 3.1 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production (Kg/Hectare) | Foliar Cover (%) |
|---|---|---|---|---|---|
| **Shrub/Vine** | | | | | |
| 1 | **Shrubs** | | | 159–222 | |
| | Mexican bladdersage | SAME | *Salazaria mexicana* | 0–56 | 0–2 |
| | threadleaf snakeweed | GUMI | *Gutierrezia microcephala* | 0–28 | 0–2 |
| | banana yucca | YUBA | *Yucca baccata* | 6–22 | 2–4 |
| | Nevada jointfir | EPNE | *Ephedra nevadensis* | 6–22 | 1–3 |
| | littleleaf ratany | KRER | *Krameria erecta* | 6–17 | 1–2 |
| | desert polygala | POAC2 | *Polygala acanthoclada* | 0–11 | 1–3 |
| | winterfat | KRLA2 | *Krascheninnikovia lanata* | 0–11 | 0–2 |
| | slender buckwheat | ERMI4 | *Eriogonum microthecum* | 0–6 | 0–1 |
| | rayless goldenhead | ACSP | *Acamptopappus sphaerocephalus* | 0–6 | 0–1 |
| | desert almond | PRFA | *Prunus fasciculata* | 0–6 | 0–1 |
| | purple sage | SADO4 | *Salvia dorrii* | 0–6 | 0–1 |
| **Grass/Grasslike** | | | | | |
| 2 | **Perennial Grasses** | | | 252–353 | |
| | black grama | BOER4 | *Bouteloua eriopoda* | 135–191 | 10–12 |
| | big galleta | PLRI3 | *Pleuraphis rigida* | 101–143 | 5–10 |
| | purple threeawn | ARPU9 | *Aristida purpurea* | 0–22 | 0–4 |
| | desert needlegrass | ACSP12 | *Achnatherum speciosum* | 9–11 | 1–3 |
| | bush muhly | MUPO2 | *Muhlenbergia porteri* | 0–6 | 0–1 |
| | Indian ricegrass | ACHY | *Achnatherum hymenoides* | 1–3 | 0–1 |
| **Forb** | | | | | |
| 3 | **Perennial Forbs** | | | 48–54 | |
| | desert trumpet | ERIN4 | *Eriogonum inflatum* | 6–28 | 0–2 |
| | whitestem paperflower | PSCO2 | *Psilostrophe cooperi* | 6–17 | 0–1 |
| | brownplume wirelettuce | STPA4 | *Stephanomeria pauciflora* | 0–2 | 0–1 |
| | macranthera | MACRA2 | *Macranthera* | 0–2 | 0–1 |
| | desert marigold | BAMU | *Baileya multiradiata* | 0–2 | 0–1 |
| | rose heath | CHER2 | *Chaetopappa ericoides* | 0–2 | 0–1 |
| | Navajo fleabane | ERCO27 | *Erigeron concinnus* | 0–2 | 0–1 |
| 4 | **Native Annual Forbs** | | | 0–7 | |
| | thymeleaf sandmat | CHSE6 | *Chamaesyce serpyllifolia* | 0–2 | 0–1 |
| | purple bird's-beak | COPA9 | *Cordylanthus parviflorus* | 0–2 | 0–1 |
| | plains flax | LIPU4 | *Linum puberulum* | 0–2 | 0–1 |
| **Tree** | | | | | |
| 5 | **Trees** | | | 99–137 | |
| | Utah juniper | JUOS | *Juniperus osteosperma* | 99–137 | 4–6 |
| | Jaeger's Joshua tree | YUBRJ | *Yucca brevifolia var. jaegeriana* | 0–84 | 0–1 |

## Animal community

Small mammals and birds eat juniper berries, and mule deer will browse juniper foliage if other food is not available (Zlatnik 1999).

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).

## Wood products

The decay resistant wood of Utah juniper is used for construction, fence posts, firewood, pencils, and Christmas trees (Zlatnik 1999).

## 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 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 2.1:
Waypoint 066-CORA

Community Phase 3.1:
11CA795267 (Type location)
11CA795202

## Type locality

| Location 1: San Bernardino County, CA | |
|---|---|
| UTM zone | N |
| UTM northing | 3898303 |
| UTM easting | 685607 |
| General legal description | The type location is in Lanfair Valley in the Mojave National Preserve approximately 3.07 miles west on New York Mountain Road from Ivanpah Road, and then 0.43 miles due north from New York Mountain Road. |

## Other references


Abdel-Magid, A. H., M. J. Tritica, and R. H. Hart. 1987. Soil and vegetation response to simulated trampling. Journal of Range Management 40:303-306.

Abella, S. R. 2009. Post-fire plant recovery in the Mojave and Sonoran Deserts of western North America. Journal of Arid Environments 73:699-707.

Allred, B. W. and K. A. Snyder. 2008. Ecophysiological responses of Chihuahuan desert grasses to fire. Journal of Arid Environments 72:1989-1996.

Brooks, M., J. Chambers, and R. McKinley. 2013. Fire history, effects and management in Southern Nevada. USDA Forest Service.

Brooks, M. L. 2011. Effects of high fire frequency in creosote bush scrub vegetation of the Mojave Desert. International Journal of Wildland Fire 21:61-68.

Brooks, M. L., C. M. D'Antonio, D. M. Richardson, J. B. Grace, J. E. Keeley, J. M. DiTomaso, R. J. Hobbs, M. Pellant, and D. Pyke. 2004. Effects of invasive alien plants on fire regimes. Bioscience 54:677-689.

Brooks, M. L., T. C. Esque, and T. Duck. 2007. Creosotebush, blackbrush, and interior chaparral shrublands. RMRS-GTR-202.

Brown, D. E. and R. A. Minnich. 1986. Fire and Changes in Creosote Bush Scrub of the Western Sonoran Desert, California. American Midland Naturalist 116:411-422.

Canfield, R. H. 1948. Perennial grass composition as an indicator of condition of Southwestern mixed grass ranges. Ecology 29:190-204.

D'Antonio, C. M. and P. M. Vitousek. 1992. Biological invasions by exotic grasses, the grass/fire cycle, and global change. Annual Review of Ecology and Systematics 23:63-87.

Havstad, K. M. and D. James. 2010. Prescribed burning to affect a state transition in a shrub-encroached desert grassland. Journal of Arid Environments 74:1324-1328.

Howard, J. L. 1997. Aristida purpurea. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory.

Hughes, L. E. 1982. A grazing system in the Mohave Desert. Rangelands 4:256-257.

Hughes, L. E. 2002. Is there recovery after fire, drought, and overgrazing? Rangelands 24:26-30.

Jeffries, D. L. and J. M. Klopatek. 1987. Effects of grazing on the vegetation of the blackbrush association. Journal of Range Management 40:390-393.

Jones, A. 2000. Effects of cattle grazing on North American arid ecosystems: a quantitative review. Western North American Naturalist 60:155-164.

Kim, C. B. 2004. Draft livestock management plan for the Mojave National Preserve. Unpublished report.

Matthews, R. F. 2000. Pleuraphis rigida. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory.

Minnich, R. A. 2003. Fire and dynamics of temperature desert woodlands in Joshua Tree National Park. Contract, Joshua Tree National Park.

Nystrom, E. C. 2003. From neglected space to protected place: an administrative history of the Mojave National Preserve. USDOI National Park Service Mojave National Preserve.

Parmenter, R. R. 2008. Long-term effects of a summer fire on desert grassland plant demographics in New Mexico. Rangeland Ecological Management 61:156-168.

Potter, L. D. and J. C. Krenetsky. 1967. Plant succession with released grazing on New Mexico range lands. Journal of Range Management 20:145-151.

Rauzi, F. and C. L. Hanson. 1966. Water intake and runoff as affected by intensity of grazing. Journal of Range Management 19:351-356.

Rauzi, F. and F. M. Smith. 1973. Infiltration rates: three soils with three grazing levels in northeastern Colorado. Journal of Range Management 26:126-129.

Sawyer, J. O., T. Keeler-Woolf, and J. M. Evans. 2009. A manual of California vegetation. 2nd edition. California Native Plant Society, Sacramento, California.

Simonin, K. A. 2000. Bouteloua eriopoda. Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory.

Snorf, J. S. 1991. Early days at Hart: Being the reminiscences of John Sherwood Snorf (Tales of the Mojave Road). 1 edition. Goffs Schoolhouse Publishing, Goffs, CA.

Webb, R. H., Steiger, J.W., Turner, R.M. 1987. Dynamics of Mojave Desert shrub assemblages in the Panamint Mountains, California. Ecology 68:478-490.

Woodmansee, R. G. and L. D. Potter. 1971. Natural reproduction of winterfat (Eurotia lanata) in New Mexico. Journal of Range Management 24:24-30.

Williams, G. W. 2003. Reference on the American Indian use of fire in ecosystems. US Forest Service.

Yao, J., D. P. C. Peters, K. M. Havstad, R. P. Gibbens, and J. E. Herrick. 2006. Multi-scale factors and long-term response of Chihuahuan Desert grasses to drought. Landscape Ecology 21:1217-1231.

Zlatnik, E. 1999. Juniperus osteosperma. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory.

## 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) | |
| Contact for lead author | |
| Date | 05/12/2025 |
| Approved by | Sarah Quistberg |
| Approval date | |

| | |
|---|---|
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

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

---

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

---

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

---

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

---

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

---

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

---

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

---

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

---

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

---

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

---

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

---

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

    Dominant:

    Sub-dominant:

Other:

Additional:

---

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

---

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

---

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

---

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

---

17. **Perennial plant reproductive capability:**

---