USDA Natural Resources
Conservation Service

Ecological site R030XB230CA
Very Rarely Flooded Deep Fan Remnants

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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 XB LRU is found across the eastern half of California, much of the mid-elevations of Nevada, the southernmost portions of western Utah, and the mid-elevations of northwestern Arizona. Elevations range from 1800-5000 feet and precipitation ranges from 4-9 inches/year, but is generally between 5-6 inches. This LRU is characterized primarily by summer precipitation, which ranges from 18-35% but averages 25%. Summer precipitation falls between July and September in the form of rain, and winter precipitation falls starting in November and ends between February and March, also mostly in the form of rain; however it does receive between 0 and 3 inches of snow, with an average of 1 inch. The soil temperature regime is thermic and the soil moisture regime is typic-aridic. Vegetation includes creosote bush (Larrea tridentata), burrobush (*Ambrosia dumosa*), Mojave yucca (*Yucca schidigera*) Joshua tree (Yucca brevifolia), chollas, cactus, big galleta grass (Pleuraphis rigida) and several other warm season grasses. At the upper portions of the LRU, plant production and diversity are greater and blackbrush (Coleogyne ramosissima) is a common dominant shrub.

Ecological site concept

This site occurs on gently sloping alluvial fan remnants with very rare sheet flooding at elevations of approximately 4000 to 4500 feet. Soils are very deep with a shallow calcic horizon and loamy textures. The soil moisture regime is typic aridic and the soil temperature regime is thermic. Creosote bush (Larrea tridentata) and winterfat (Krascheninnikovia lanata) are the dominant shrubs of the reference plant community, big galleta (Pleuraphis rigida) is an important grass, and a sparse but uniform cover of Jaeger's Joshua Tree (Yucca brevifolia var. jaegariana) is present. Production reference value (RV) is relatively high, at 951 pounds per acre, and ranges from 774 to 1155 pounds per acre depending on annual precipitation. Winterfat has relatively high water requirements, and is most abundant and vigorous on soils receiving additional run-on (Woodmansee and Potter 1971). This species requires good soil drainage, and is most commonly found on slightly to moderately alkaline soils (Woodmansee, 1971). Very rare flooding and well-drained deep soils provides favorable habitat for winterfat, big galleta and creosote bush.

This is a group concept and provisional STM that also covers the following ecological site: R030XB035NV.

Associated sites

R030XB009CA	**Loamy Cool Aridic Fans 6-8** This site occurs on adjacent fan remnants at slightly lower elevations and with soils that have a shallow to moderately deep argillic horizon.
R030XY222CA	**Typic Aridic Ephemeral Drainageway Order 3 4-7" p.z.** This site occurs on adjacent large drainageways. Desert willow (Chilopsis linearis) and catclaw acacia (Acacia greggii) are characteristic species.

Similar sites

R030XB174CA	**Sandy Fan Aprons** This site occurs at more southerly latitudes on soils without a calcic horizon. Winterfat is not present.
R030XB039NV	**LIMY FAN 5-7 P.Z.** This site occurs on inset fans. It is more productive and is dominated by big galleta.
R030XB009CA	**Loamy Cool Aridic Fans 6-8** This site occurs on soils with an argillic horizon shallow to the soil surface. Winterfat is not an important species.
R030XB005NV	**Arid Active Alluvial Fans** This site occurs at a lower elevation range on shallower soils. Production is lower, burrobush is a dominant species and winterfat is not present.

Table 1. Dominant plant species

Tree	(1) *Yucca brevifolia var. jaegeriana*
Shrub	(1) *Larrea tridentata* (2) *Krascheninnikovia lanata*
Herbaceous	(1) *Pleuraphis rigida*

Physiographic features

This ecological site occurs on very rarely flooded fan remnants. It occurs at elevations of 4050 to 4430 feet on slopes of 1 to 4 percent. Runoff class is low.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Very rare
Elevation	4,050–4,430 ft
Slope	1–4%
Aspect	Aspect is not a significant factor

Climatic features

The mean annual precipitation is between 6 to 8 inches (150 to 200 mm) and the mean annual air temperature ranges from 59 to 62.5 degrees F (15-17 degrees C) across the elevation range of the site. For outlying areas just outside of this temperature and precipitation range, temperature and precipitation are directly proportional. For example, areas where climate models suggest the air temperature is higher than 17 degrees C should also show the area receives more than 8 inches of precipitation, otherwise the site should be in the 4-6 precipitation zone.

Precipitation amounts can vary greatly. Some years the mean annual precipitation can exceed 18 inches, other years the mean annual precipitation can be less 4 inches. The Society of Range Management (1989) define drought as "... prolonged dry weather when precipitation is less than 75% of the average amount". By this definition, it is not uncommon for this site to experience drought every 2 to 5 years. Some decades can pass with no drought and

other decades may have several consecutive years of drought. Precipitation is bi-modal with precipitation mainly occurring during the winter and summer.

Like much of the Mojave and areas west of the Mojave Desert, June is typically the driest month of the year with mean temperatures near 80 degrees F. It is not uncommon for June to experience temperatures over 90 degrees F. July and August are the hottest months of the year and can have average maximum temperatures above 95 degrees F.

Table 3. Representative climatic features

Frost-free period (average)	278 days
Freeze-free period (average)	310 days
Precipitation total (average)	8 in

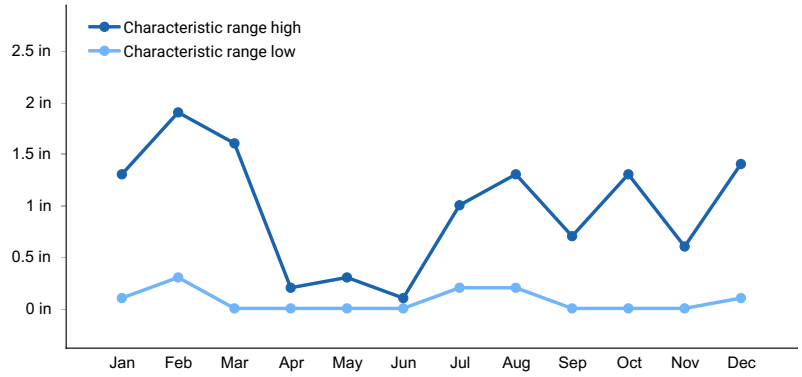


Figure 1. Monthly precipitation range

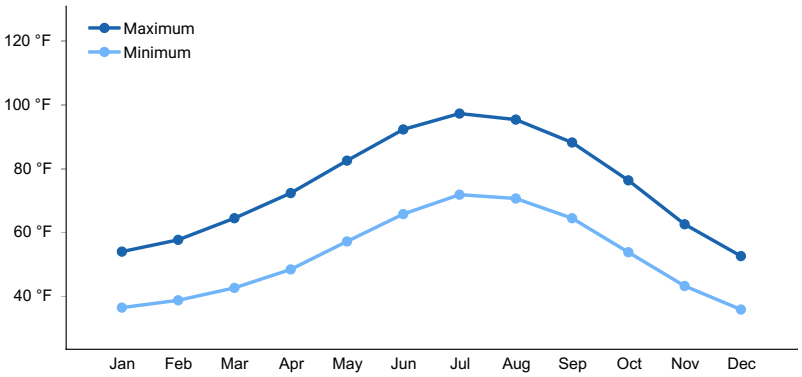


Figure 2. Monthly average minimum and maximum temperature

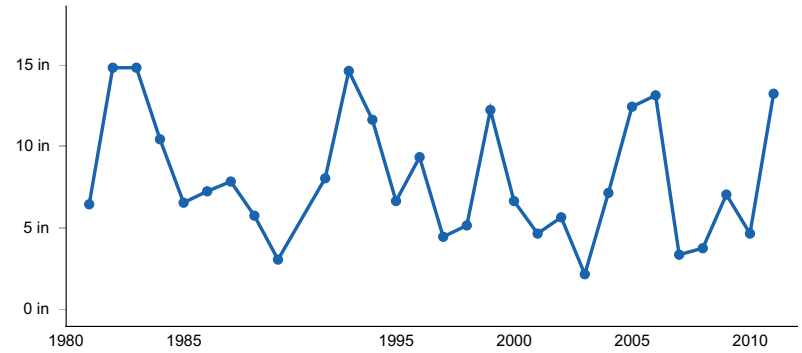


Figure 3. Annual precipitation pattern

Climate stations used

- (1) SEARCHLIGHT [USC00267369], Searchlight, NV

Influencing water features

Soil features

The soils associated with this ecological site formed in alluvium from granitoid and limestone rock. They are very deep, and are well-drained with moderately rapid permeability. A calcic horizon begins at a depth of 11.8 inches. Surface and subsurface textures are fine sandy loam. Surface rock fragments less than 3 inches in diameter average 7 percent, and larger fragments are not typically present. Subsurface fragments less than 3 inches in diameter average 3 percent and larger fragments are not typically present (for a depth of 69 inches). Soils have a thermic temperature regime and a typic aridic soil moisture regime. The soil series that have been correlated with this site include Noshade (Coarse-loamy, mixed, superactive, thermic Typic Haplocalcids), and a minor component of Corbilt (Coarse-loamy, mixed, superactive, thermic Duric Haplocalcids). The Noshade series consists of very deep, well-drained soils that formed in alluvium from mixed sources. Surface textures are fine-sandy loams with fine sandy loams beneath.

This ecological site is correlated with the following map units and soil components in the Mojave National Preserve Soil Survey: (Mapunit number; Mapunit name; Component; phase; component percent):

204 ; Noshade fine sandy loam, 1 to 4 percent slopes ; Noshade ; very rarely flooded ; 90
414 ; Helendale-Yorktain complex, 1 to 4 percent slopes ; Corbilt ; ; 7

Table 4. Representative soil features

Parent material	(1) Alluvium–granite
Surface texture	(1) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Soil depth	59 in
Surface fragment cover <=3"	7%
Available water capacity (0-40in)	5.1–5.9 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–4
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	3%

Ecological dynamics

Abiotic factors
This site occurs on gently sloping alluvial fan remnants with very rare sheet flooding at elevations of approximately 4000 to 4500 feet. Soils are very deep with a shallow calcic horizon and loamy textures. The soil moisture regime is

typic aridic and the soil temperature regime is thermic. Creosote bush and winterfat are the dominant shrubs of the reference plant community, big galleta is an important grass, and a sparse but uniform cover of Jaeger's Joshua Tree is present. Production reference value (RV) is relatively high, at 951 pounds per acre, and ranges from 774 to 1155 pounds per acre depending on annual precipitation. Winterfat has relatively high water requirements, and is most abundant and vigorous on soils receiving additional run-on (Woodmansee and Potter 1971). This species requires good soil drainage, and is most commonly found on slightly to moderately alkaline soils (Woodmansee, 1971). Very rare flooding and well-drained deep soils provides favorable habitat for winterfat, big galleta and creosote bush.

Disturbance dynamics
The disturbances impacting this plant community are fire, invasion by non-native annual species, livestock grazing, and land-clearing for dryland farming and homesteading.

Prior to European settlement, fire in this ecological site was likely relatively rare due to low abundance of fine fuels between shrubs, and patchy perennial grasses (e.g. Brown and Minnich 1986, Brooks and Matchett 2006, Brooks et al. 2007). However, one or multiple years of heavy winter precipitation such as occurs during El Niño events (Hereford et al. 2006), or heavy summer precipitation could lead to a relatively heavy standing crop of native annuals in intershrub spaces, providing a continuous fine fuel layer that could carry a fire (Brown and Minnich 1986, Minnich 2003). Years of heavy summer or early fall precipitation that lead to high production in big galleta, also increasing fire likelihood (Minnich 2003). The dominant shrubs are killed by moderate to high severity fire (Carey 1995, Brooks et al. 2007), and typically take many years to recolonize after a stand-clearing fire (e.g Brown and Minnich 1986, Brooks et al. 2007, Engel and Abella 2011, Steers and Allen 2011). Following fire, big galleta gains dominance in this site, and annuals greatly increase in abundance with release from competition with shrubs, and this increase in fine fuels increases the likelihood of repeat burning.

Naturalization of non-native annual species such as red brome (*Bromus rubens*), common Mediterranean grass (*Schismus barbatus*), cheatgrass (*Bromus tectorum*), and redstem stork's 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-native species (State 2). Invasion by non-native annual grasses is thought to have increased flammability of invaded Mojave Desert shrublands by providing higher levels of fine fuels (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). In this ecological site, abundance of big galleta was found to be more significant after disturbance than invasion by non-native annuals, although non-native annuals did increase. Winterfat re-establishment is greatly suppressed by the presence of abundant annual grasses and can also be suppressed by native perennial grasses, which typically recover well after fire (Woodmansee and Potter 1971, Hild et al. 2007); thus recurrent fire can prevent winterfat recovery.

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 Desert where this site occurs. 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) (Kim 2004).

Heavy cattle grazing in the arid west has been shown to have numerous negative effects on vegetative communities, including decreases in cryptogram crust cover, seedling survival, total biomass, perennial grass and shrub cover, and 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 (Rauzi and Hanson 1966, Abdel-Magid et al. 1987). Grazing in winterfat dominated communities has been demonstrated to increase soil compaction, lower soil aggregate stability, increase bare ground cover and decrease winterfat, biological crust, and litter? cover (Rasmussen and Brotherson 1986, Matney 2010). 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 (Rasmussen and Brotherson 1986). Ten years of

monitoring (1970 to 1980) of a grazing system where sites were rested every other year in the Arizona strip of the Mojave Desert, which has similar climatic and environmental characteristics as this site, found an upward trend in winterfat and burrobush (*Ambrosia dumosa*) cover, a loss of cool season perennial grasses such as Indian ricegrass (Achntherum hymenoides) and desert needlegrass (*Achnatherum speciosum*), and typically (but not always) downward trends on big galleta cover (Hughes 1982). Higher utilization, e.g. above 50 percent, caused loss of native perennial grasses (Hughes 1982), potentially causing a permanent shift to a degraded state. This transition has not been observed within this ecological site, and is not included in the state-and-transition model, although sustained heavy grazing may cause this shift.

Large portions of this ecological site were cleared for dryland farming and homesteading in the early 1900's – 1920s (Carpenter et al. 1986, Sharp and Moore 2004). Existing vegetation was chained and soils were plowed, but most were abandoned by 1930 (Carpenter et al. 1986). Many of these cleared areas were subsequently grazed until 2000. Recovery of these cleared areas resembles recovery after fire; big galleta is strongly dominant, the dominant shrubs are greatly reduced, overall diversity is higher, and annual species are more abundant.

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

R030XB230CA Very Rarely Flooded Deep Fan Remnants

Yucca brevifolia var. jaegeriana/Larrea tridentata-Krascheninnikovia lanata /Pleuraphis rigida

Jaeger's Joshua tree/creosote bush-winterfat/big galleta

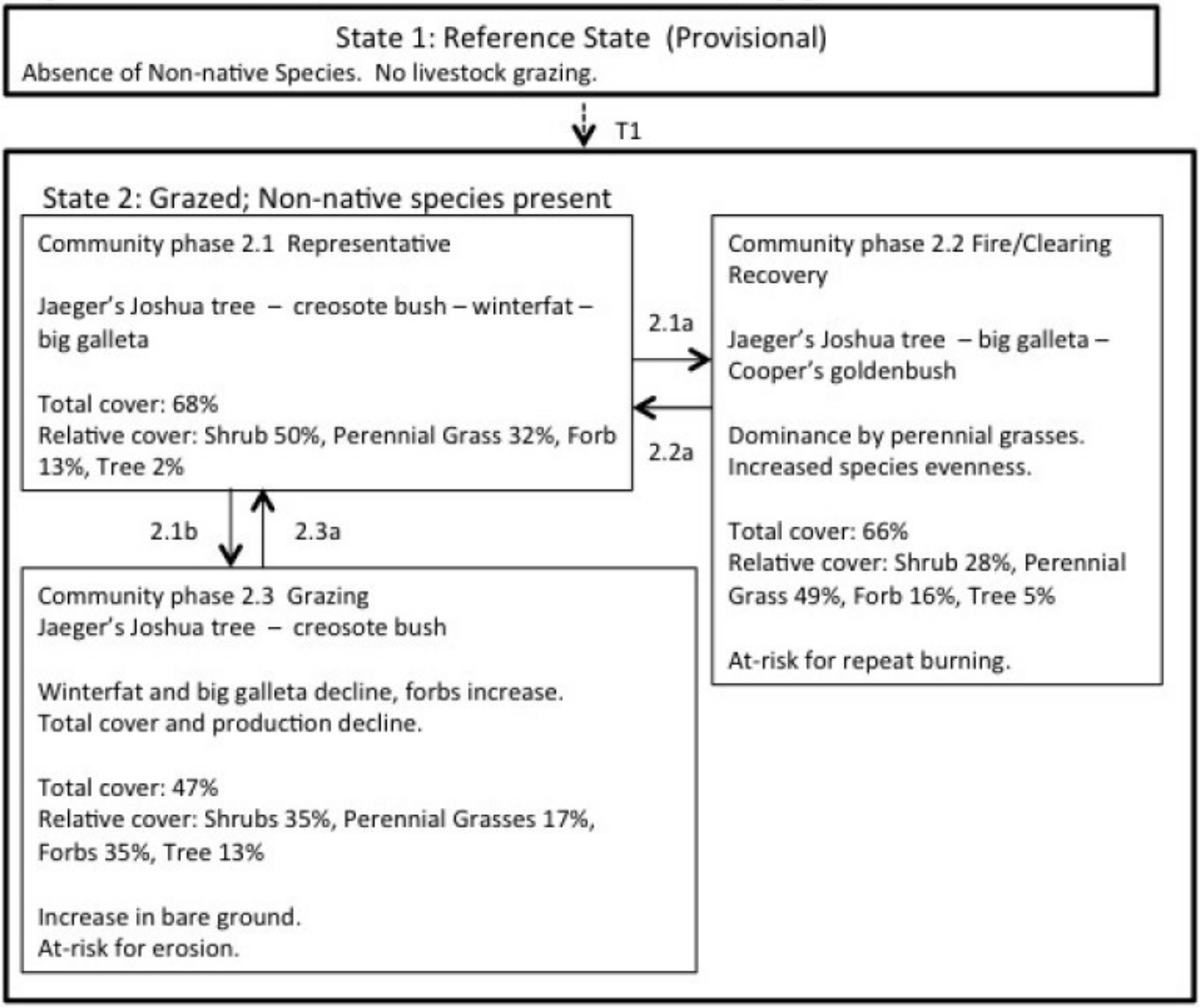


Figure 5. R030XB230CA

State 1
Reference (Provisional)

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

occurred with climatic variability.

Community 1.1
Reference Community (Provisional)

The reference plant community was dominated by creosote bush, winterfat, and big galleta, with a sparse but uniform cover of Jaeger's Joshua tree. Secondary perennial grasses including bush muhly (*Muhlenbergia porteri*), Indian ricegrass, and desert needlegrass were also present, and perennial grass cover was likely higher prior to the introduction of grazing (Brooks et al. 2007).

State 2
Grazed, Non-native species present

This is the current representative state for this ecological site. It is similar in composition to the reference state, but non-native species are present, and livestock grazing and high severity, large fires introduce new ecological dynamics.

Community 2.1
Representative Community

Figure 6. Community Phase 2.1

The representative plant community is a productive shrub-grassland dominated by creosote bush, winterfat, and big galleta. Relative shrub cover is approximately 50 percent, while grass cover is 34 percent. Nevada ephedra (*Ephedra nevadensis*) is an important secondary shrub. Minor shrubs include waterjacket (*Lycium andersonii*), Mojave yucca (*Yucca schidigera*), threadleaf snakeweed (*Gutierrezia microcephala*), rayless goldenhead (Acamptopappus spherocephalus), peachthorn (*Lycium cooperi*), Cooper’s goldenbush (*Ericameria cooperi*), and buck-horn cholla (*Cylindropuntia acanthocarpa*). Bush muhly is an abundant secondary perennial grass, and Indian ricegrass and desert needlegrasses are minor species. The native annual grass sixweeks fescue (*Vulpia octoflora*) may be present. Forbs are a minor component of this plant community, native annual forbs recorded in the representative phase include little desert trumpet (*Eriogonum trichopes*), miniature woollystar (*Eriastrum diffusum*), bristly fiddleneck (Amsinkia tessellata), and desert Indianwheat (*Plantago ovata*). The non-native redstem stork’s bill may be abundant, and the non-native annual grasses common Mediterranean grass and red brome are typically present. Jaeger's Joshua tree provides uniform canopy. Ungrazed representative community data are not available. The community phase data presented below has been free of grazing for approximately 12 years, and represent the best ecological condition that could be located. Perennial grass production and cover were probably higher prior to grazing.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	545	655	764
Grass/Grasslike	225	272	315
Tree	0	12	50
Forb	0	12	25
Total	**770**	**951**	**1154**

Table 6. Ground cover

Tree foliar cover	1-3%
Shrub/vine/liana foliar cover	20-35%
Grass/grasslike foliar cover	15-25%
Forb foliar cover	0-8%
Non-vascular plants	0%
Biological crusts	0%
Litter	5-10%
Surface fragments >0.25" and <=3"	3-6%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	30-40%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	0-5%	0-10%
>0.5 <= 1	–	–	0-2%	0-5%
>1 <= 2	0-1%	8-20%	15-25%	0-1%
>2 <= 4.5	0-1%	20-30%	1-3%	0-1%
>4.5 <= 13	1-3%	5-10%	–	–
>13 <= 40	1-3%	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Community 2.2
Fire/Clearing Recovery

Figure 8. Community Phase 2.2

Initially annual species and resprouting or re-colonizing herbaceous species dominate this phase. Native forbs that may become dominant after fire or clearing include little desert trumpet, bristly fiddleneck, miniature woollystar, desert globemallow (*Sphaeralcea ambigua*), and desert marigold (*Baileya multiradiata*). If burned when big galleta is green (which would typically be the case during the summer monsoon season), big galleta will quickly resprout and become abundant (Matthews 2000, Minnich 2003), though if big galleta is dormant when burned it may be killed by a hot fire (Matthews 2000). The community phase data (cover and composition only) described in the narrative below represent an example of community composition approximately 100 years after land clearing. Depending on the stage of recovery, and climatic conditions after recovery, different community compositions are likely. This community phase is characterized by dominance by big galleta, with 25 to 35 percent cover. Grasses contribute approximately 54 percent of the total vegetative cover, while shrubs contribute 28 percent. The disturbance adapted Cooper's goldenbush is the most abundant shrub in this phase, and shrub species evenness is higher. Burrobrush (*Hymenoclea salsola*), another disturbance adapted species, is present. Shrub diversity is higher, and in addition to the species listed in phase 2.1, Mojave yucca (*Yucca schidigera*), eastern Mojave buckwheat (*Eriogonum fasciculatum*), and beavertail pricklypear (*Opuntia basilaris*) are present at trace to four percent cover. Perennial forbs including Mojave aster (*Xylorhiza tortifolia*), desert trumpet, and desert globemallow are present at low cover. Redstem stork's bill may abundant. Increased cover and biomass of big galleta makes this community more susceptible to repeat burning, which would perpetuate this phase.

Table 8. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-20%
Grass/grasslike foliar cover	30-35%
Forb foliar cover	0-12%
Non-vascular plants	0%
Biological crusts	0%
Litter	4-6%
Surface fragments >0.25" and <=3"	10-15%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	15-25%

Table 9. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	1-5%	0-12%
>0.5 <= 1	–	–	0-3%	0-2%
>1 <= 2	–	11-20%	29-35%	0-2%
>2 <= 4.5	0-1%	4-9%	2-4%	–
>4.5 <= 13	1-3%	2-9%	–	–
>13 <= 40	1-3%	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Community 2.3
Grazed

Figure 9. Community Phase 2.3

This community phase may develop with grazing, especially at higher utilization levels (Hughes 1982). The data presented in the tables and narrative below represent conditions 12 years after grazing was ended. The site was located close to ranch headquarters, and appears to have been heavily grazed. Specific community phase composition may vary with time since grazing and intensity of use. This phase is characterized by a decline in overall cover and production, a decline in winterfat and perennial grasses, and an increase in forbs. Creosote bush is dominant. Big galleta is still the dominant grass, but has approximately half of the annual production as the reference community phase. Secondary shrubs such as littleleaf ratany (*Krameria erecta*), threadleaf snakeweed (Gutierezzia microcephala), buck-horn cholla, and Nevada ephedra may increase. Loss of vegetative cover increases the risk of erosion in this phase. This community phase is at risk of transitioning to a degraded state where perennial grasses are lost with ongoing heavy grazing.

Table 10. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	480	575	670
Tree	115	135	160
Grass/Grasslike	80	95	115
Forb	5	6	7
Total	**680**	**811**	**952**

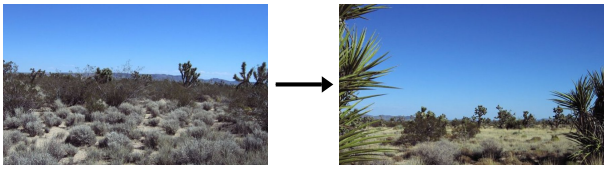
Table 11. Ground cover

Tree foliar cover	2-5%
Shrub/vine/liana foliar cover	20-30%
Grass/grasslike foliar cover	6-10%
Forb foliar cover	0-16%
Non-vascular plants	0%
Biological crusts	0%
Litter	10-15%
Surface fragments >0.25" and <=3"	25-35%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	15-20%

Table 12. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	0-8%	0-18%
>0.5 <= 1	–	0-4%	0-8%	0-5%
>1 <= 2	0-1%	5-10%	4-8%	2-5%
>2 <= 4.5	1-3%	6-13%	1-3%	–
>4.5 <= 13	2-5%	1-3%	–	–
>13 <= 40	2-5%	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Pathway 2.1a
Community 2.1 to 2.2



Representative Community **Fire/Clearing Recovery**

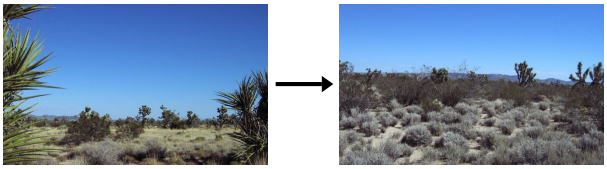
Occurs with moderate to severe fire or land-clearing.

Pathway 2.1b
Community 2.1 to 2.3

Representative Community **Grazed**

May occur with grazing.

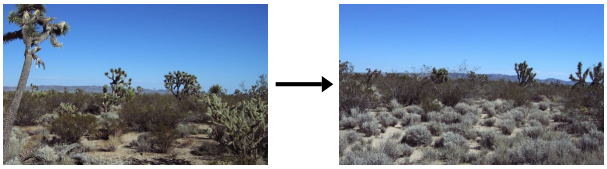
Pathway 2.2a
Community 2.2 to 2.1



Fire/Clearing Recovery | Representative Community

Occurs with time and a lack of further disturbance such as burning or grazing. The time necessary for recovery is unknown.

Pathway 2.3a
Community 2.3 to 2.1



Grazed | Representative Community

Occurs with time, with no additional disturbance including grazing and severe drought. The time necessary for recovery is unknown.

Transition T1
State 1 to 2

This transition occurred with naturalization of non-native annual species such as red brome, common Mediterranean grass, cheatgrass, and redstem stork's 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.

Additional community tables

Table 13. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
1	**Native shrubs**			545–764	
	creosote bush	LATR2	*Larrea tridentata*	305–455	20–25
	winterfat	KRLA2	*Krascheninnikovia lanata*	168–250	8–12
	Nevada jointfir	EPNE	*Ephedra nevadensis*	0–55	0–3
	Cooper's goldenbush	ERCO23	*Ericameria cooperi*	0–5	0–1
	threadleaf snakeweed	GUMI	*Gutierrezia microcephala*	0–5	0–1
	rayless goldenhead	ACSP	*Acamptopappus sphaerocephalus*	0–5	0–1
	Mojave yucca	YUSC2	*Yucca schidigera*	0–5	0–1
	water jacket	LYAN	*Lycium andersonii*	0–5	0–1
	peach thorn	LYCO2	*Lycium cooperi*	0–5	0–1
Grass/Grasslike					
2	**Native perennial grasses**			225–315	
	big galleta	PLRI3	*Pleuraphis rigida*	143–213	15–25
	bush muhly	MUPO2	*Muhlenbergia porteri*	72–108	2–5
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–5	0–1
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–5	0–1
3	**Native Annual Grasses**			0–5	
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–5	0–1
4	**Non-native Annual Grasses**			0–10	
	red brome	BRRU2	*Bromus rubens*	0–5	0–2
	common Mediterranean grass	SCBA	*Schismus barbatus*	0–5	0–2
Forb					
5	**Non-native Annual Forbs**			0–20	
	redstem stork's bill	ERCI6	*Erodium cicutarium*	0–20	0–5
6	**Native Annual Forbs**			0–5	
	little deserttrumpet	ERTR8	*Eriogonum trichopes*	0–2	0–3
	desert Indianwheat	PLOV	*Plantago ovata*	0–1	0–1
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	0–1	0–1
	miniature woollystar	ERDI2	*Eriastrum diffusum*	0–1	0–1
Tree					
7	**Trees**			0–50	
	Jaeger's Joshua tree	YUBRJ	*Yucca brevifolia var. jaegeriana*	0–50	0–3

Table 14. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
1	**Shrubs**			480–670	
	creosote bush	LATR2	*Larrea tridentata*	324–484	10–12
	littleleaf ratany	KRER	*Krameria erecta*	25–41	3–5
	winterfat	KRLA2	*Krascheninnikovia lanata*	11–16	0–2
	Nevada jointfir	EPNE	*Ephedra nevadensis*	9–14	1–3
	threadleaf snakeweed	GUMI	*Gutierrezia microcephala*	5–7	0–2
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	0–3	0–2
	water jacket	LYAN	*Lycium andersonii*	0–3	0–2
	beavertail pricklypear	OPBA2	*Opuntia basilaris*	0–3	0–1
	banana yucca	YUBA	*Yucca baccata*	0–2	0–2
	spiny hopsage	GRSP	*Grayia spinosa*	0–2	0–2
	buck-horn cholla	CYAC8	*Cylindropuntia acanthocarpa*	0–2	0–2
	Cooper's goldenbush	ERCO23	*Ericameria cooperi*	0–2	0–2
	rayless goldenhead	ACSP	*Acamptopappus sphaerocephalus*	0–1	0–2
Grass/Grasslike					
2	**Perennial Grasses**			80–115	
	big galleta	PLRI3	*Pleuraphis rigida*	60–90	5–7
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–7	0–2
	bush muhly	MUPO2	*Muhlenbergia porteri*	0–5	0–3
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–1	0–1
3	**Non-native Annual Grasses**			0–80	
	red brome	BRRU2	*Bromus rubens*	0–80	0–8
Forb					
4	**Perennial Forbs**			1–4	
	wishbone-bush	MILAV	*Mirabilis laevis var. villosa*	0–2	0–1
	whitestem paperflower	PSCO2	*Psilostrophe cooperi*	0–2	0–1
5	**Native Annual Forbs**			0–2	
	little deserttrumpet	ERTR8	*Eriogonum trichopes*	0–1	0–2
	miniature woollystar	ERDI2	*Eriastrum diffusum*	0–1	0–1
6	**Non-native Annual Forbs**			0–60	
	redstem stork's bill	ERCI6	*Erodium cicutarium*	0–60	0–15
Tree					
7	**Trees**			114–160	
	Jaeger's Joshua tree	YUBRJ	*Yucca brevifolia var. jaegeriana*	115–160	2–5

Animal community

Winterfat provides highly valuable winter forage for native browsers and domestic wildlife (e.g. Carey 1995, Matney 2010). Big galleta is a valuable forage plant for livestock, and is especially palatable after summer rains (Williams 2003). 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). Joshua tree is considered a keystone species, as it is the only tall vegetation in these shrublands. The structural diversity it provides is important for birds.

Other products

Joshua tree leaves were used by the Cahuilla for making ropes, baskets, sandals, clothing and mats. Red and black dyes were obtained from the roots (http://herb.umd.umich.edu/herb/search.pl?searchstring=Yucca+brevifolia).

Flowers and fruit pods of Joshua tree were used as food by the Cahuilla (http://herb.umd.umich.edu/herb/search.pl?searchstring=Yucca+brevifolia).

The Cahuilla used creosote stems and leaves to make a medicinal tea. A solution was also was applied to open wounds to draw out poisons (http://www.malkimuseum.org/garden.htm).

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:
11CA795151(Type location)
11CA795274
2011CA795005

Community Phase 2.2:
11CA795264

Community Phase 2.3:
11CA795103

Type locality

Location 1: San Bernardino County, CA	
UTM zone	N
UTM northing	3898125
UTM easting	666414
General legal description	The type location is located in Lanfair Valley in the Mojave National Preserve approximately 2 miles east on New York Mountain Road from the intersection of New York Mountain Road with Ivanpah Road.

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Contributors

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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)	
Contact for lead author	
Date	05/11/2025
Approved by	Sarah Quistberg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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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:**

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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):**

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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:**

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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):**

---

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:**