Ecological site R030XB009CA
Loamy Cool Aridic Fans
6-8

Last updated: 2/18/2025
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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. The climate of the area is hot and dry with mostly hyperthermic and thermic soil temperature regimes and typic-aridic soil moisture regimes. Mean annual air temperatures are between 59-68 degrees F (15-20 C) with average summer maximum temperatures between 100-115 degrees F (38-46 C) and average winter minimum temperatures between 32-59 degrees F (0-15 C). This MLRA is within the arid climate zone however steep elevational gradients contribute to microclimates where semi-arid [mean annual precipitation is greater than 8 inches (200mm)] and hyper-arid [mean annual precipitation is less than 4 inches (100mm)] islands exist. Elevations range from below sea level to over 12,000 feet (3650 meters) in the higher mountain areas. Generally above 5,000 feet, soil temperature regimes can be mesic, cryic and frigid with soil moisture regimes being xeric or ustic. Orographic effects and low elevations can create hyper-arid conditions where the soil moisture regime is aridic-aridic. Due to the extreme elevational range found within this MLRA, land resource units (LRUs) were designated to group areas within the MLRA into similar land units. LRU Description: The arid climate zone (XB in ESD ID) 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 4-8 inches/year. Precipitation is bi-modal for most of the Mojave with precipitation occurring in winter and summer. Areas west of the 117 degree W meridian near Barstow, CA receive precipitation mainly during the winter months (Hereford et al. 2004). The soil temperature regimes are hyperthermic and thermic with a typic-aridic soil moisture regime. 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, where the mean annual precipitation is between 6 to 8 inches (150-200 mm), plant production and diversity are greater and blackbrush (Coleogyne ramosissima) is a common dominant shrub.

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 is linked to group concept R030XB188CA. This ecological site occurs on fan remnants within the lower fan piedmont. Soils have a typic-aridic soil moisture regime, and a cool thermic soil temperature regime. Soils are moderately deep to very deep, with a fine-loamy particle size control section. The upper boundary of an argillic or calcic horizon is present within the top 25cm of the soil profile. In rare instances a root restrictive horizon such as a duripan or petrocalcic horizon may be present. The representative plant community is dominated by blackbrush (Coleogyne ramosissima). Creosote bush (Larrea tridentate) and Mojave yucca (Yucca schidigera)are subdominants. Joshua Tree (Yucca brevifolia var. jaegeriana) is often an emergent canopy species at 0 to 3 percent cover.

Associated sites

R030XC047CA	**Bi-Modal Semi-Arid Order 3 Ephemeral Wash** Occurs in stream order 3 size washes which drain the semi-arid zones (greater than 8 inches of mean annual precipitation).
R030XB039NV	**LIMY FAN 5-7 P.Z.** Occurs on nearby alluvial fans with moderately deep or deeper soils [soil profile depth is greater than 40 inches (100 cm)] with no shallow diagnostic horizons.
R030XB172CA	**Warm Gravelly Shallow Hills** Occurs on nearby warm hills with a thermic and/or hyperthermic soil temperature regime. Mean annual air temperature is generally greater than 17 degrees C.

Similar sites

R030XB173CA	**Coarse Loamy Very Deep Fan Remnants** The same ecological site concept. Plant Community Phase 2.4.
R030XB043NV	**CLAYPAN 5-7 P.Z.** The same ecological site concept. Plant Community Phase 3.2.
R030XB137CA	**Granitic Loam** This ecological site occurs at lower elevations, has lower production, and is co-dominated by white bursage.
R030XB107NV	**COARSE GRAVELLY LOAM 5-7 P.Z.** The same ecological site concept. Plant Community Phase 2.4.
R030XB039NV	**LIMY FAN 5-7 P.Z.** This ecological site has higher production and a greater diversity of native perennial grasses.
R030XB143CA	**Shallow Granitic Loam 5-7" P.Z.** The same ecological site concept. Plant Community Phase 2.2.
R030XB183CA	**Loamy Very Deep Fan Remnants** The same ecological site concept. Plant Community Phase 2.3.

Table 1. Dominant plant species

Tree	Not specified

Shrub	(1) *Coleogyne ramosissima*
Herbaceous	Not specified

Physiographic features

This ecological site occurs on fan remnants with 1 to 4% slopes at elevations of 3600 to 4200 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant
Flooding frequency	Very rare to rare
Elevation	1,100 – 1,280 m
Slope	0 %
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. June, like much of the Mojave and areas west of the Mojave, 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)	280 days
Freeze-free period (average)	310 days
Precipitation total (average)	200 mm

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

Influencing water features

None

Soil features

The soils associated with this ecological site are moderately to very deep soils formed in alluvium from mixed sources. The particle size control section ranges from being a fine-loam to a coarse-loam or loamy-skeletal. The upper boundary of an argillic and/or a calcic horizon is often within the top 10 inches (25cm) of the soil profile. Depth to a root restrictive layer such as a petrocalcic horizon or duripan, when present, is typically 20 inches (50cm) or deeper. Soils have a thermic temperature regime and a typic aridic moisture regime.

Surface textures are sandy loams, loams and loamy sands, often with a gravelly modifier. Surface rock fragments range from 10 to 90% surface cover. Fine gravels often make up more than 30% of the surface cover whereas large surface fragments are scarce and often make up less than 30% of the surface cover. Soil subgroups include Argic Petrocalcids, Typic Haplargids, Typic Calciargids and Typic Haplocalcids with Typic Haplargids being most common.

Table 4. Representative soil features

Parent material	(1) Alluvium – granite
Surface texture	(1) Sandy loam (2) Very gravelly loam (3) Loamy sand
Family particle size	(1) Loamy
Drainage class	Well drained to excessively drained
Permeability class	Very slow to rapid
Soil depth	10 – 150 cm
Surface fragment cover <=3"	10 – 90 %
Surface fragment cover >3"	0 – 30 %
Available water capacity (0-101.6cm)	2.79 – 16.76 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 20 %

Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	6.1 – 10
Subsurface fragment volume <=3" (Depth not specified)	0 – 50 %
Subsurface fragment volume >3" (Depth not specified)	0 – 30 %

Ecological dynamics

This ecological site is within the broad creosote and blackbrush eco-tone. At the highest elevations of this ecological site, monospecific stands of blackbrush (Coleogyne ramosissima) exist with a wide range of other species. Sub dominant species include Mojave Yucca (Yucca schidigera) and creosote bush (Larrea tridentata). Joshua Tree (Yucca brevifolia var. jaegeriana) is often an emergent canopy species at 0 to 3 percent cover.

At the lower elevations of this ecological site blackbrush tends to be a co-dominant with creosote bush. Disturbance at this site can create a variety of responses with an overall trend in reduction of blackbrush and an increase in pioneering species. In some cases creosote bush and white bursage may replace blackbrush as the long-lived perennial species following disturbance.

Typical disturbance for this ecological site include prolonged severe drought, flash flooding and fire. Prior to European colonization of the Mojave Desert, widespread fire was an unlikely event due to the lack of a continuous fuel layer. Small burned areas were probably common due to lightning strikes.

Fire frequency and extent probably increased following the arrival of homesteaders in the Mojave. The proximity of this site to more mesic mountainous areas and it's relatively flat topography made this site a target for land clearing and plowing as required by the Homestead Law (U.S. BLM 1971). Land clearing allowed annual and pioneering species to create a continuous fuel layer for fire to spread.

State and transition model

Figure 5. State and Transition Model for R030XB009CA

Additional community tables

Table 5. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Shrub/Vine					
1	**Native shrubs**			319-448	
	blackbrush	CORA	*Coleogyne ramosissima*	84-280	9-16
	creosote bush	LATR2	*Larrea tridentata*	56-168	7-17
	Nevada jointfir	EPNE	*Ephedra nevadensis*	0-67	0-4
	Mojave yucca	YUSC2	*Yucca schidigera*	39-67	2-3

	spiny menodora	MESP2	*Menodora spinescens*	0-11	0-3
	buck-horn cholla	CYAC8	*Cylindropuntia acanthocarpa*	0-11	0-1
	burrobush	AMDU2	*Ambrosia dumosa*	0-7	0-1
	branched pencil cholla	CYRA9	*Cylindropuntia ramosissima*	0-6	0-2
	rayless goldenhead	ACSP	*Acamptopappus sphaerocephalus*	0-6	0-1
	beavertail pricklypear	OPBA2	*Opuntia basilaris*	0-6	0-1
	banana yucca	YUBA	*Yucca baccata*	0-6	0-1
	Cooper's goldenbush	ERCO23	*Ericameria cooperi*	0-6	0-1
	turpentinebroom	THMO	*Thamnosma montana*	0-4	0-1
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	0-2	0-1
	littleleaf ratany	KRER	*Krameria erecta*	0-2	0-1
	Jaeger's Joshua tree	YUBRJ	*Yucca brevifolia var. jaegeriana*	0-1	1-3
	whitestem paperflower	PSCO2	*Psilostrophe cooperi*	0-1	0-1
	winterfat	KRLA2	*Krascheninnikovia lanata*	0-1	0-1
	water jacket	LYAN	*Lycium andersonii*	0-1	0-1
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	0-1	0-1
	burrobrush	HYSA	*Hymenoclea salsola*	0-1	0-1
Grass/Grasslike					
2	**Native perennial grasses**			0-17	
	big galleta	PLRI3	*Pleuraphis rigida*	0-17	0-3
	bush muhly	MUPO2	*Muhlenbergia porteri*	0-1	0-1
3	**Non-native annual grasses**			0-34	
	red brome	BRRU2	*Bromus rubens*	0-34	0-2
	sixweeks grama	BOBA2	*Bouteloua barbata*	0-3	0-5
	cheatgrass	BRTE	*Bromus tectorum*	0-1	0-1
Forb					
4	**Native forbs**			0-22	
	little deserttrumpet	ERTR8	*Eriogonum trichopes*	0-20	0-6
	desert marigold	BAMU	*Baileya multiradiata*	0-11	0-1
	chia	SACO6	*Salvia columbariae*	0-6	0-1
	combseed	PECTO	*Pectocarya*	0-1	0-1
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	0-1	0-1
5	**Non-native annual forbs**			0-45	
	redstem stork's bill	ERCI6	*Erodium cicutarium*	0-2	0-1

Table 6. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 9. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 10. Community 3.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

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.

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Contributors

Dustin Detweiler

Approval

Kendra Moseley, 2/18/2025

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	08/22/2026
Approved by	
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:**

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

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

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

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

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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):**

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

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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):**

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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:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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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:**

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17. **Perennial plant reproductive capability:**
