USDA Natural Resources Conservation Service

Ecological site R030XB170CA
Bouldery Very Shallow To Shallow Gravelly Slopes

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General information

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

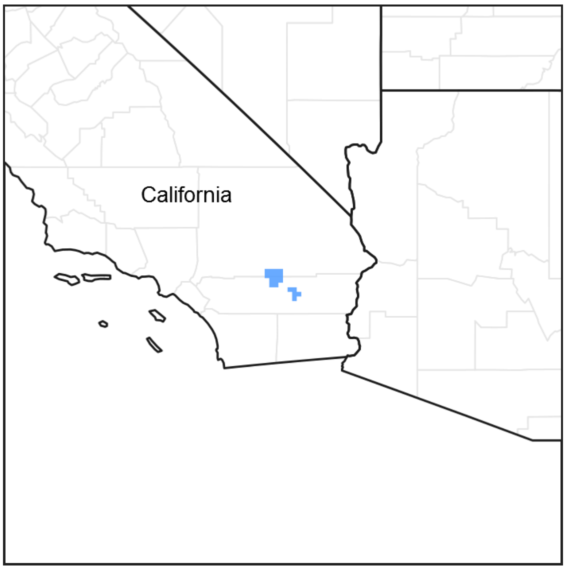

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

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 (primarily hyperthermic and thermic; however at higher elevations, generally above 5000 feet, mesic, cryic and frigid) and dry (aridic). 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:

This LRU (designated by 'XB') 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 to 5000 feet and precipitation ranges from 4 to 9 inches per year, but is generally between 5-6 inches. This LRU is characterized primarily by the summer precipitation it receives, ranging 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, burrobush, Nevada jointfir, ratany, Mojave yucca, Joshua tree, chollas, cactus, big galleta grass and several other warm season grasses. At the upper portions of the LRU, plant production and diversity are greater and blackbrush is a common dominant shrub.

Ecological Site Concept -

This site occurs at on steep rocky slopes with representative conditions between elevations of 3300 to 5800 feet on soils with a typic-aridic soil moisture regime. There is a high percentage of rock outcrops throughout the site, with very shallow to shallow sandy soils on slopes among outcrops. Single-leaf pinyon pine (*Pinus monophylla*), California juniper (Juniperus California) and Muller's oak (*Quercus cornelius-mulleri*) dominate around rock outcrops, with blackbrush (*Coleogyne ramosissima*) dominant on shallow soils among outcrops. The roots of single-leaf pinyon pine, California juniper and Muller's oak can access relatively high water content available in cracks in the weathering granitic bedrock of rock outcrops and between large surface fragments. Soil moisture is more limiting in the shallow soils among outcrops, and in the typic-aridic soil moisture regime of this ecological site, blackbrush, which is shallow-rooted and very drought-tolerant, dominates.

Data ranges in the physiographic data, climate data, water features, and soil data sections of this Ecological Site Description are based on all components (major and minor) correlated with this ecological site.

Associated sites

R030XB140CA	**Shallow Hill 4-6" P.Z.** R030XB140CA is found on narrow ridges and summits. White bursage (Ambrosia dumosa) and creosote bush (Larrea tridentata) are dominant species.
R030XB164CA	**Steep South Slopes** R030XB164CA is found on warm slopes. Brittlebush (Encelia farinosa) is a dominant species.
R030XB166CA	**Dissected Pediment, Cool** R030XB166CA is found on pediment downslope of R030XB170CA. The dominant species are blackbrush (Coloegyne ramosissima) and California juniper (Juniperus californica).
R030XB168CA	**Cool Deep Sandy Fans** R030XB168CA is found on fan remnants downslope from this site. California juniper (Juniperus californica) and blackbrush (Coleogyne ramosissima) are dominant species.
R030XB172CA	**Warm Gravelly Shallow Hills** R030XB172CA is found on lower elevation warmer slopes. Creosote bush (Larrea tridenatata) and Parish's goldeneye (Vigueira parishi) are dominant species.
R030XB183CA	**Loamy Very Deep Fan Remnants** R030XB183CA is found on fan remnants downslope from this site. Blackbrush (Coleogyne ramosissima) and creosote bush (Larrea tridentata) are dominant species.
R030XB188CA	**Cool Shallow to Moderately Deep Fans** R030XB188CA is found on pediments downslope from this ecological site. Blackbrush (Coleogyne ramosissima) and creosote bush (Larrea tridentata) are dominant species.
R030XB189CA	**Shallow Cool Hills** R030XB189 is found on adjacent hills and mountains with a low percentage of large rock outcrop. The dominant species are blackbrush (Coleogyne ramosissima) and California juniper (Juniperus californica).
R030XB193CA	**Very Shallow To Moderately Deep Gravelly Slopes** R030XB193CA is found on rocky warm thermic slopes. White bursage (Ambrosia dumosa), Jojoba (Simmondsia chinensis), Parish's goldeneye (Vigueira parishii), and waterjacket (Lycium andersonii) are important species.
R030XB225CA	**Warm Sloping Pediments** R030XB225CA is found on pediments downlope from this site. White bursage (Ambrosia dumosa) and Hall's shrubby spurge (Tetracoccus hallii) are dominant species.
R030XD003CA	**Hyperthermic Steep South Slopes** R030XD003CA is found on hyperthermic slopes. Brittlebush (Encelia farinosa) is the dominant species.

R030XE196CA	**Sandy Xeric-Intergrade Slopes** R030XE196CA is found on slopes with a xeric intergrade soil moisture regime. Single-leaf pinyon pine (Pinus monophylla) and California juniper (Juniperus californica) are dominant species, and shrub diversity is high.

Similar sites

R030XB189CA	**Shallow Cool Hills** R030XB189CA is found on hills without areas of large rock outcrop. The dominant species are blackbrush (Coleogyne ramosissima) and California juniper (Juniperus californica), and Muller oak (Quercus cornelius-mulleri) and singleleaf pinyon (Pinus monophylla) are trace if present.
R030XE196CA	**Sandy Xeric-Intergrade Slopes** R030XE196CA is found on slopes with a xeric intergrade soil moisture regime. Single-leaf pinyon pine (Pinus monophylla) and California juniper (Juniperus californica) are dominant species, with a diverse shrub understory. Blackbrush (Coleogyne ramosissima), may be present, but is not a dominant species.
R030XE191CA	**Dry Sandy Mountain Slopes** R030XE191CA is found on soils with a xeric intergrade soil moisture regime. Single-leaf pinyon pine and Muller's oak (Quercu cornelius-mulleri) dominate and are not restricted to rock outcrops. Blackbrush (Coleogyne ramosissima) is not a dominant species.
R030XB166CA	**Dissected Pediment, Cool** R030XB166CA is found on pediment. The dominant species are blackbrush (Coloegyne ramosissima) and California juniper (Juniperus californica).
R030XE200CA	**Xeric Very Deep Sandy Fan Aprons On Pediments** R030XE200CA is found on low hills with a xeric intergrade soil moisture regime. Single-leaf pinyon pine and Muller's oak (Quercus cornelius-mulleri) are not restricted to rock outcrops.

Table 1. Dominant plant species

Tree	(1) *Pinus monophylla*
Shrub	(1) *Coleogyne ramosissima* (2) *Quercus cornelius-mulleri*
Herbaceous	Not specified

Physiographic features

This ecological site occurs on hills and mountains with large components of rock outcrop at elevations of 2760 to 5800 feet, but representative conditions occur between 3300 and 5800 feet. Slopes may range from 4 to 60 percent, but slopes above 30 percent are typical. The site experiences no flooding or ponding and runoff class is high to very high.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Mountain
Flooding frequency	None
Ponding frequency	None
Elevation	841–1,768 m
Slope	4–60%

Climatic features

The climate on this site is arid characterized by cool, somewhat moist winters and hot, dry summers. The average annual precipitation ranges from 4 to 8 inches with most falling as rain from November to March. Mean annual air temperature ranges from 55 to 63 degrees F (13 to 17 C). The frost free period is 210 to 270 days.

Maximum and minimum monthly climate data for this ESD were generated by the Climate Summarizer

(http://www.nm.nrcs.usda.gov/technical/handbooks/nrph/Climate_Summarizer.xls) using data
from the following climate stations (results are weighted averages; numbers in square brackets represent relative weights):

LTHC1 Lost Horse, Joshua Tree National Park
(Period of record = 1991 to 2011) [2]

44467 Kee Ranch, CA (Period of record = 1948 to 1979) [1]

The data from multiple weather were combined to most accurately reflect the climatic conditions of this ecological site. The Lost Horse weather station is closest to this ecological site but is limited by the number of years data was collected. The Kee Ranch weather station contains precipitation data for all years of the period of record but has no temperature data.

Table 3. Representative climatic features

Frost-free period (average)	270 days
Freeze-free period (average)	0 days
Precipitation total (average)	203 mm

Influencing water features

Soil features

The soils associated with this ecological site are very shallow to shallow, and somewhat excessively to excessively drained. These soils formed in colluvium derived from granite over residuum weathered from granite. Surface textures are sand, gravelly sand, and gravelly loamy sand, with gravelly loamy sand or gravelly sand over bedrock beneath. For rock fragments less than 3 inches in diameter, the percent surface cover ranges from 25 to 85 percent, and subsurface volume ranges from 0 to 32 percent (subsurface fragments by volume are RV ranges for all soil profile horizons for a depth of 0 to 10 inches). For rock fragments greater than 3 inches in diameter, the percent surface cover ranges from 0 to 55 percent, and subsurface volumes range from 0 to 10 percent.

The associated soils make up a major component in one map unit and only minor components (10% or less) in remaining mapunits. These soil series include: Pinecity (mixed, thermic, shallow Typic Torripsamments) and a major component of Pioneertown (mixed, thermic Lithic Torripsamments). The Pinecity series have 25 to 70 percent surface rock fragments, dominated by medium and coarse gravel, and the Pioneertown series have 80 to 85 percent rock fragments, predominantly fine gravel. The Pinecity series is underlain by weathered, fractured, extremely weakly cemented granitic bedrock with low excavation difficulty with fractures greater than 20 centimeters apart; very few very fine roots in cracks and very few fine roots matted at the top of the horizon, and the Pioneertown series is underlain by indurated granitic bedrock, with very fine roots common in cracks, and 2 percent distinct clay films on the top surface.

This ecological site is correlated with the following map units and soil components in the Joshua Tree National Park Soil Survey:

3325;Ironped-Rock outcrop-Hexie complex, 30 to 60 percent slopes;Pinecity;cool;10
4811;Rock outcrop-Pioneertown association, 30 to 60 percent slopes, dry;Pioneertown;;10
4830;Rock outcrop-Pinecity complex, 8 to 30 percent slopes;Pinecity;cool;10
3120;Aguilareal-Rock outcrop-Blackeagle complex, 30 to 60 percent slopes;Pinecity;cool;5
3285;Pinecity-Contactmine-Desertqueen-Rock outcrop association, 30 to 50 percent slopes;Pinecity;cool;2
3296;Desertqueen-Pinecity complex, 15 to 50 percent slopes;Pinecity;cool;3
4610;Jumborox-Desertqueen-Rock outcrop association, 2 to 8 percent slopes;Pinecity;cool;5
4804;Rock outcrop-Ironped-Pinecity association, 30 to 60 percent slopes;Pinecity;cool;2
4806;Rock outcrop;Pinecity;cool;5

Table 4. Representative soil features

Parent material	(1) Colluvium–granite
Surface texture	(1) Sand (2) Gravelly loamy sand (3) Gravelly sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained to excessively drained
Permeability class	Moderate to rapid
Soil depth	5–36 cm
Surface fragment cover <=3"	25–85%
Surface fragment cover >3"	0–55%
Available water capacity (0-101.6cm)	0.51–1.52 cm
Calcium carbonate equivalent (0-101.6cm)	0–1%
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)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–32%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

Abiotic Factors

The most important abiotic factors driving this ecological site are a cool thermic climate with a typic aridic soil moisture regime, a high proportion of rock outcrops, and shallow soils among outcrops.

This site occurs at on steep rocky slopes at elevations of approximately 2800 to 5800 feet. There is a high percentage of granitic rock outcrops throughout the site, with very shallow to shallow sandy soils on open expanses of slope between outcrops. Single-leaf pinyon pine (*Pinus monophylla*), California juniper (Juniperus California) and Muller's oak (*Quercus cornelius-mulleri*) are dominant around rock outcrops, and blackbrush (*Coleogyne ramosissima*) is dominant on shallow soils among outcrops.

Single-leaf pinyon pine, Muller's oak and California juniper are widespread dominants of Mojave Desert pinyon-juniper woodland on shallow-soiled xeric slopes in southern California mountains (Minnich 2007). The soil moisture regime of this ecological site is below the range that can support continuous woodland, and on open slopes trees are unable to compete against blackbrush, a shallow-rooted, very drought tolerant shrub. However, trees are competitive amongst granite outcrops and in areas with large surface fragments, which ameliorate soil moisture deficits by providing a source of run-on (Danin 1999, 2008), reducing evaporation (Pearson and Theimer 2004), and providing a deep source of water in cracks of fractured bedrock (Witty et al. 2003, Danin 2008).

Blackbrush is a dominant shrub in the mid-elevation zones of the Mojave and Great Basin Deserts. A shallow root system enables blackbrush to thrive in soils where soil moisture is restricted to shallow depths, and extreme drought-tolerance coupled with extreme longevity allow blackbrush to achieve community dominance over shorter-lived, less drought-tolerant species, provided there are long periods of time without disturbance (Pendleton and Meyer 2004). Thus, blackbrush communities are characterized by high blackbrush dominance, with a minor contribution of secondary shrubs (Brooks and Matchett 2003, Brooks et al. 2007). California juniper is more drought-tolerant than pinyon pine or Muller’s oak (Chambers 2001), and is associated with the blackbrush community of this ecological site, however, it is a secondary species to blackbrush.

Disturbance
Invasion by non-native species, drought and insect attack, and fire are the primary disturbances affecting this ecological site.

Drought, and interactions with insect attack and disease are the most important drivers of dynamics within desert pinyon-juniper woodlands (Minnich 2007, Romme et al. 2009). Pinyon-juniper woodlands are highly susceptible to drought, with widespread mortality and increased susceptibility to insect attack during drought (Shaw 2006, Minnich 2007, Romme et al. 2009). Trees in southern California close to urban centers may be especially at risk because increased nitrogen deposition from air pollution further increases the susceptibility to pathogens (Jones et al. 2004). Pinyon-juniper woodlands in the southwest experienced unprecedented drought and insect-induced mortality in the early 2000’s, with higher mortality in lower elevation stands, a significant increase in standing dead pinyon pines, and far greater mortality in pinyon relative to juniper species (Shaw 2006). Cone-bearing trees (> 35 years of age) are more likely to die during drought, so older stands may be more severely drought-affected (Romme et al. 2009).

Drought is also an important shaping force in Mojave Desert shrub communities (Webb et al. 2003, Hereford et al. 2006). Drought-induced mortality of long-lived shrubs like blackbrush is rare; these shrubs are more likely to exhibit branch-pruning, and or limited recruitment during drought (e.g. Hereford et al. 2006, Miriti et al. 2007), leading to reduced cover and biomass in drought-afflicted communities. Short-lived perennial shrubs and perennial grasses have high rates of drought-induced mortality (Webb et al. 2003, Bowers 2005, Hereford et al. 2006, Miriti et al. 2007). Annual species remain dormant in the soil seedbank (Beatley 1969, 1974, 1976), further reducing cover.

The historic fire return interval in southern California pinyon-juniper woodlands is approximately 480 years, and in some stands there is no evidence of widespread fire (Minnich 2007, Romme et al. 2009). Areas dominated by rock outcrop are especially unlikely to burn, because vegetation density and understory cover is sparse (Romme et al. 2009). Consequently these areas are significant in that they house many of the remaining old-growth pinyon-juniper stands (Weisberg et al. 2008, Romme et al. 2009).

Non-native annual grasses (red brome [*Bromus rubens*], cheatgrass [*Bromus tectorum*] and Mediterranean grass [Schismus species]) have become naturalized throughout the Mojave Desert over the past century (Rickard and Beatley 1965, D'Antonio and Vitousek 1992, Brooks 1999, Reid et al. 2006, Norton et al. 2007). Invasion by non-native annual grasses has increased the flammability of Mojave Desert shrub communities by providing a continuous fine fuel layer between widely spaced shrubs (Brown and Minnich 1986, Brooks 1999, Brooks et al. 2004, Rao and Allen 2010, Rao et al. 2010). After fire, these communities appear to be more susceptible to invasion by exotic grasses, leading to a grass-fire cycle (D'Antonio and Vitousek 1992). Non-native annual grasses have also invaded desert pinyon-juniper woodlands; their role in promoting fire in these systems is unclear since although there has been a recent increase in fire in pinyon-juniper woodlands in the southwest, this could be a natural product of the build-up of woody fuels after very long periods of time without fire rather than a result of non-native annual grass cover (Minnich 2007).

State and transition model

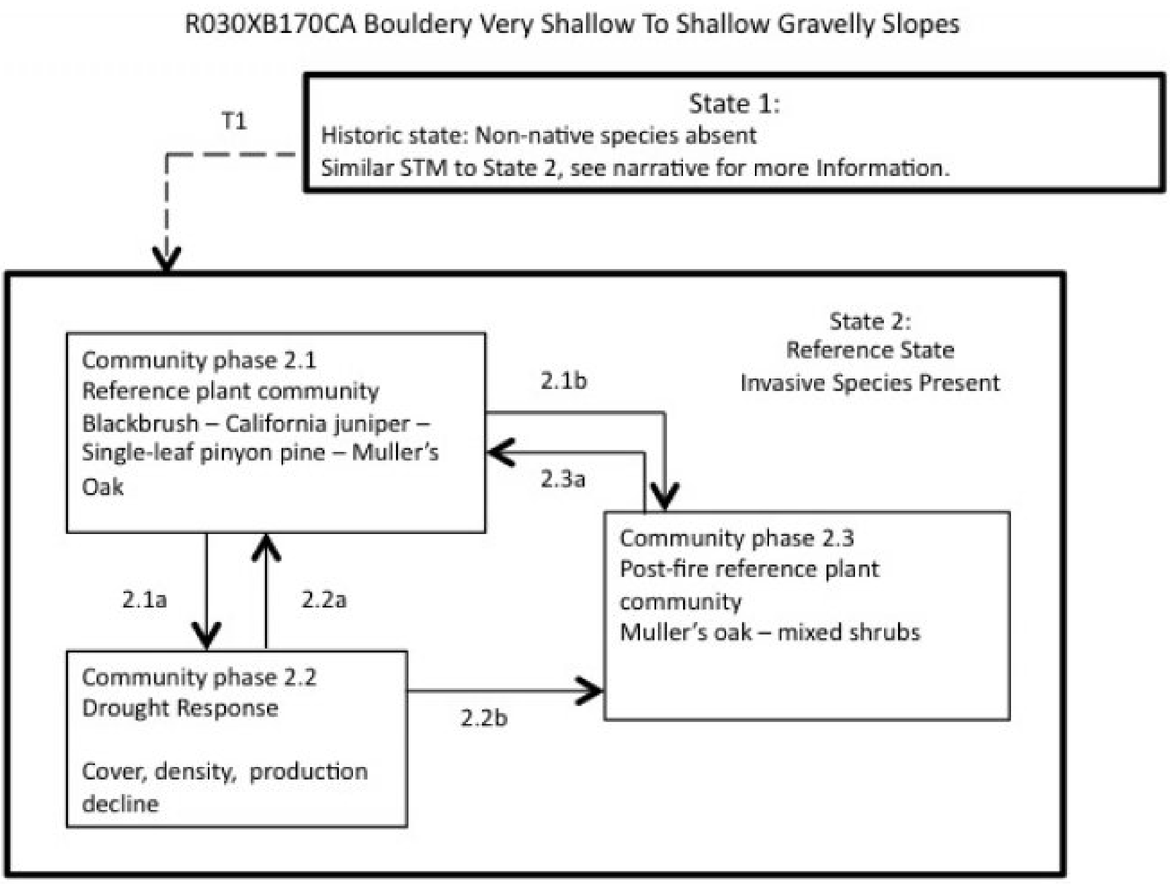

Figure 4. R030XB170CA

State 1
Historic State

State 1 represents the historic range of variability for this ecological site. This state no longer exists due to the ubiquitous naturalization of non-native species in the Mojave Desert. Periodic drought and very rare fire were the natural disturbances influencing this ecological site. Data for this State does not exist, but it would have been similar to State 2, except with only native species present. See State 2 narrative for more detailed information.

State 2
Reference State

State 2 represents the current range of variability for this site. Non-native annuals, including red brome and cheatgrass are naturalized in this plant community. Their abundance varies with precipitation, but they are at least sparsely present (as current year's growth or present in the soil seedbank).

Community 2.1
Reference Plant Community

Figure 5. Community Phase 2.1

The reference plant community is dominated by blackbrush on shallow soils in continuous patches among rock outcrops, and by single-leaf pinyon pine, Muller's oak and California juniper among rock outcrops. Secondary shrubs are more significant as understory in the pine-oak community, and may include Parry's beargrass (*Nolina parryi*), narrowleaf goldenbush (*Ericameria linearifolia*), broom snakeweed (*Gutierrezia sarothrae*), Mojave sage (*Salvia mohavensis*), and white sagebrush (Artemesia ludoviciana). Secondary shrubs present as minor species in the blackbrush dominated community include Mojave yucca (*Yucca schidigera*), eastern Mojave buckwheat (*Eriogonum fasciculatum*), Mexican bladdersage (*Salazaria mexicana*), and snapdragon penstemon (*Keckiella antirrhinoides*). The perennial bunchgrasses desert needlegrass (*Achnatherum speciosum*) and Sandberg bluegrass (*Poa secunda*) are more significant in the pine-oak community. A diverse assemblage of native winter annuals is seasonally present, as are the non-native annual grasses red brome and cheatgrass.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	303	499	695
Grass/Grasslike	22	191	252
Forb	6	39	50
Tree	22	34	45
Total	**353**	**763**	**1042**

Community 2.2
Drought Response

Figure 7. Community Phae 2.2

This community phase develops after prolonged or severe drought and is characterized by an overall decline in cover and production, mortality of single-leaf pinyon pine, and an increase in the importance of Muller's oak and

California juniper. Pine mortality is more severe in older trees, and the prevalence of large, standing dead trees increases. There may also be mortality in California juniper, but at lower rates than pine. Muller's oak has extremely high drought-tolerance, and since it is shade-intolerant, it may increase in response to the mortality of pine. Declines in cover are a result of branch-pruning of long-lived shrubs (including blackbrush and Mojave yucca), mortality of shorter-lived perennials (including eastern Mojave buckwheat, snakeweed and desert needlegrass), and lack of emergence of annual forbs and grasses.

Community 2.3
Fire regeneration community

Community Phase 2.3 This community phase is characterized by high mortality of pinyon pine, California juniper and blackbrush, an increase in the importance of Muller's oak, and an increase in shrub species evenness. Pinyon pine, California juniper and blackbrush are all generally killed by even moderate fire intensity. Muller's oak is a vigorous resprouter, and will begin recovery in the first year after fire. Other species capable of resprouting include Mojave yucca, Parry's beargrass, snapdragon penstemon, desert needlegrass and Sandberg bluegrass. Species capable of quickly recolonizing from seed become more important, including narrow-leaved goldenbush, Mexican bladdersage, Mojave sage, white sage, snakeweed, and eastern Mojave buckwheat. As tall shrub cover increases, shade-dependent seedlings of California juniper and Pinyon pine begin to establish. Tree establishment may also occur in the shelter of boulders and rock outcrops (Pearson and Theimer 2004). California juniper re-establishes faster than pinyon pine (Tausch and West 1988). After fifty years with no disturbance, pine cover will begin to dominate, shading out shorter-lived shrubs, and mature woodlands re-establish at 100 to 150 years post-fire (Wangler and Minnich 1996). With favorable climatic conditions and nearby seed sources available in unburned pockets, blackbrush re-colonizes continuous soil patches. After long periods of time (> 100 years) with no disturbance, blackbrush gradually replaces shorter-lived species and regains dominance (Vasek 1983, Abella 2009, Vamstad 2009).

Pathway 2.1a
Community 2.1 to 2.2

Reference Plant Community

Drought Response

This pathway occurs with severe or prolonged drought.

Pathway 2.1b
Community 2.1 to 2.3

This pathway occurs with severe fire. The high rock outcrop cover and widely spaced vegetation of this ecological site confer high resistance to fire and high resilience to fire if it does occur. Ignition in either the single-leaf pinyon pine – Muller's oak or the blackbrush community would generally result in spot fire due to the lack of continuous fuel. However, given the steep slopes of this ecological site, fire could be more extensive during periods of extreme fire behavior. Even if fire were more extensive, rock outcrop islands would provide numerous patches of unburned vegetation that could provide a seed source for post-fire colonization.

Pathway 2.2a
Community 2.2 to 2.1

Drought Response

Reference Plant Community

This pathway occurs with a return to average climatic conditions. Cover and production increase with growth of long-lived shrubs, colonization by shorter-lived shrubs and emergence of annual species. Pinyon pine is slow-growing (Zouhar 2001), and the effects of drought-induced pine mortality are long-lasting. Dead standing trees persist, and their replacement will take decades.

Pathway 2.2b
Community 2.2 to 2.3

This pathway occurs with severe fire. Although live annuals are largely absent from Community Phase 2.2, standing annual biomass in drought years immediately following a period of heavy precipitation poses a severe risk for fire. Cured native annual cover may pose a risk during the first year of drought, and non-native annual grasses pose a risk for three or more years (Minnich 2003, Brooks et al. 2007, Rao et al. 2010). Although the standing dead pinyon are highly flammable, their limited extent, and the protective effects of high rock cover limit the spatial spread of fire should these ignite.

Pathway 2.3a
Community 2.3 to 2.1

This pathway occurs with a long period of time without disturbance (100 – 150 years).

Transition 1
State 1 to 2

This transition occurred with the naturalization of non-native species in this ecological site. Non-native species were introduced with settlement of the Mojave Desert region in the 1860s.

Additional community tables

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
1	**Native shrubs**			303–695	
	blackbrush	CORA	*Coleogyne ramosissima*	123–336	5–15
	Muller oak	QUCO7	*Quercus cornelius-mulleri*	78–163	1–5
	snapdragon penstemon	KEAN	*Keckiella antirrhinoides*	0–52	0–1
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–52	0–1
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	10–19	0–1
	Mexican bladdersage	SAME	*Salazaria mexicana*	0–13	0–1
	narrowleaf goldenbush	ERLI6	*Ericameria linearifolia*	6–12	0–2
	Parry's beargrass	NOPA	*Nolina parryi*	0–11	0–1
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	3–8	0–1
	Mojave yucca	YUSC2	*Yucca schidigera*	0–3	0–1
	beavertail pricklypear	OPBA2	*Opuntia basilaris*	0–2	0–1
	Mojave sage	SAMO3	*Salvia mohavensis*	0–2	0–1
Tree					
2	**Trees**			22–45	
	singleleaf pinyon	PIMO	*Pinus monophylla*	20–36	1–2
	California juniper	JUCA7	*Juniperus californica*	3–4	1–2
Grass/Grasslike					
3	**Native perennial grasses**			4–11	
	Sandberg bluegrass	POSE	*Poa secunda*	4–9	0–1
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–2	0–1
5	**Non-native annual grasses**			0–157	
	red brome	BRRU2	*Bromus rubens*	0–146	0–6
	cheatgrass	BRTE	*Bromus tectorum*	0–11	0–1
Forb					
4	**Native forbs**			6–50	
	combseed	PECTO	*Pectocarya*	0–39	0–1
	narrowleaf bedstraw	GAAN2	*Galium angustifolium*	0–11	0–1
	gilia	GILIA	*Gilia*	0–1	0–1
	coastal tidytips	LAPL	*Layia platyglossa*	0–1	0–1
	Lindley's silverpuffs	MILI5	*Microseris lindleyi*	0–1	0–1
	lacy phacelia	PHTA	*Phacelia tanacetifolia*	0–1	0–1
	pincushion flower	CHFR	*Chaenactis fremontii*	0–1	0–1
	western tansymustard	DEPI	*Descurainia pinnata*	0–1	0–1

Animal community

This ecological site provides important habitat for birds, reptiles and mammals due to its structural diversity and pinyon-juniper woodlands.

The following reptiles and mammals are likely to be found within this ecological site (based on habitat preferences).

REPTILES
Lizards:

Desert banded Gecko (Coleonyx variegatus variegatus)
Northern desert iguana (Dipsosaurus dorsalis dorsalis)
Mojave collared lizard (Crotaphytus bicinctores)
Western chuckwalla (Sauromalus aster obesus)
Yellow-backed spiny lizard (Sceloporus magister uniformus)
Great Basin fence lizard (Sceloporus biseriatus longipes)
Western brush lizard (Urosaurus graciosus graciosus)
Desert side-blotched lizard (Uta stansburiana stejnegeri)
Great Basin Whiptail (Aspidoscelis tigris tigris)

Snakes:
Southwestern blind snake (Leptotyphlops humilis humilis)
Desert rosy boa (Lichanura trivirgata gracia)
Mojave glossy snake (Arizona occidentalis candida) California kingsnake (Lampropeltis getula californae)
Red coachwhip (Masticophis flagellum piceus)
Desert night snake (Hypsiglena torquata deserticola)
California kingsnake (Lampropeltis getula californae)
California striped racer (Masticophis lateralis lateralis)
Western leaf-nosed snake (Phyllorynchus decurtatus perkinsi)
Great Basin gopher snake (Pituophis catenifer deserticola)
Western long-nosed snake (Rhinocheilus lecontei lecontei)
Smith’s black-headed snake (Tantilla hobartsmithi)
California lyre snake (Trimorphodon biscutatus vandenburghi)
Southwestern speckled rattlesnake (Crotalus mitchelli Pyrrhus)
Red diamond rattlesnake (Crotalus ruber ruber)
Southern pacific rattlesnake (Crotalus helleri)

MAMMALS

Western spotted skunk (Spilogale gracilis gracilis)
Long-tailed weasel (Mustela latirosta)
California desert bat (Myotis californicus stephensi)
Western pipistrelle (Pipistrellus hesperus hesperus)
Desert big brown bat (Eptesicus fuscus pallidus)
Desert long-legged bat (Myotis volans interior)
Northern fringed bat (Myotis thysanodes thysanodes)
Spotted bat (Euderma maculatum)
Western mastiff bat (Eumops perotis)
Hoary bat (Lasiurus cinereus cinereus)
Pallid bat (Antrozous pallidus minor)
Desert coyote (Canis macrotis arsipus)
Common gray fox (Urocyon cinereoargenteus scottii)
California mountain lion (Felis concolor californica)
Desert bobcat (Lynx rufus baileyi)
California ringtail (Bassariscus astutus ocatvus)
Southern mule deer (Odoceileus hemionus fuliginatus)
Desert bighorn sheep (Ovis canadensis nelson)
Southern Desert cottontail (Sylvilagus audobonii arizonae)
Dusky chipmonk (Tamias obscurus davisi)
Whitetail antelope squirrel (Ammospermphilus leucurus leucurus)
Western Mojave ground squirrel (Spermophilus beecheyi parvulus)
Long-tailed pocket mouse (Chaetodipus mojavensis)
Merriam's kangaroo rat (Dipodomys deserti)
Desert wood rat (Neotoma fuscipes simplex)
Eastern dusky-footed wood rat (Neotoma fuscipes simplex)
White-throated wood rat (Neotoma albigula venusta)
Desert canyon mouse (Peromyscus crinitus stephensi)
Southern brush mouse (Peromyscus boylii rowleyi)

Sonoran deer mouse (Peromyscus maniculatus sonoriensis)
Southern California pinyon mouse (Peromyscus truei chlorus)
Desert grasshopper mouse (Onychomys torridus pulcher)
Desert shrew

Recreational uses

This ecological site may be used for hiking, rock climbing, and aesthetic enjoyment.

Wood products

Wood of single-leaf pinyon may be used for fuel wood and fence posts, particle and cement board (Zouhar 2001). It is not suitable for lumber because of its small size and irregular growth pattern (Zouhar 2001).

California juniper is a poor source of lumber because of low volume and multi-stemmed growth form. However, early ranchers used juniper for fenceposts, and it is used for fuel and as Christmas trees (Cope 1992).

Other products

Single-leaf pinyon pine is very important for many Native American tribes. The melted gum is used to bind and heal cuts, prevent sunburn, to stop menstruation, for muscle soreness, diarhea, rheumatism, colds, and nausea, among others. Pinyon nuts are an important food source, and were the staple food source in the past for many tribes. The pinyon seeds were one of the few foods given to babies as an alternative food source by the Cahuilla. Needles are used to make baskets, and were used as a spice to flavor meats. Wood and bark were used in house construction, and the pitch was used for water-proofing. http://herb.umd.umich.edu/herb/search.pl?searchstring=Pinus%20monophylla).

California juniper is used by Native Americans for a variety of medicinal purposes, including cold remedies, cough treatment, anticonvulsive, to induce sweating, for hangovers, for hypotension, fever and as a muscle relaxant for childbirth relief. Berries are eaten fresh, and dried for later use, ground to make porridge or to make bread. The Kawaiisu use the bark as a building cover, and the wood to make arrows and cooking utensils. (http://herb.umd.umich.edu/herb/search.pl?searchstring=Juniperus+californica)

Blackbrush is used by the Kawaiisu for treating gonorrhea, and the Havasupai use blackbrush as source of fodder when grass is not available. (http://herb.umd.umich.edu/herb/search.pl?searchstring=Coleogyne+ramosissima).

Inventory data references

The following NRCS plots were used to describe this ecological site:

Community Phase 2.1:

1249719940 (type location)
121CoJuPi
wypt_122 QUPICJ
12497_123_A
12497_123_B

(PIMO cover and production estimated from 196CA data, CORA production estimated from 189CA data)

Type locality

Location 1: San Bernardino County, CA	
UTM zone	N
UTM northing	3765939

UTM easting	573691
General legal description	The type location is 0.6 miles at 202 degrees from the Quail Springs Parking Area in Joshua Tree National Park.

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Contributors

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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	
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:**

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:**