USDA Natural Resources Conservation Service

Ecological site R030XB140CA
Shallow Hill 4-6" P.Z.

Accessed: 05/18/2024

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.

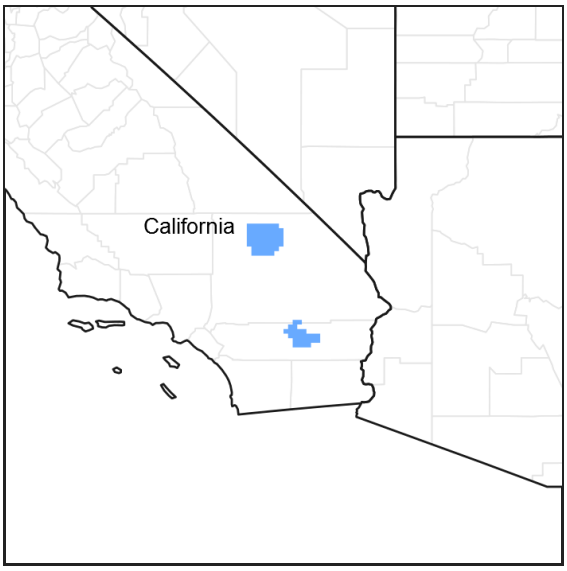

Figure 1. Mapped extent

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.

Classification relationships

This ecological site is found within the Larrea tridentata Shrubland Alliance (Sawyer et al. 2009).

Ecological site concept

This site occurs on steep sideslopes of fan remnants, hillslopes and mountains on all exposures between 3525 ft (1075 m) and 3800 ft (1150 m) and on northerly exposures between 2800 ft (850m) and 3525 ft (1075 m). Slope gradients of 15 to 50 percent are typical. Soils range from very shallow to shallow or if deeper, they are shallow to a diagnostic horizon like an argillic or calcic horizon.

Production representative value (RV) is 315 pounds per acre, and depending on annual precipitation and annual forb production, ranges from 165 to 543 pounds per acre. Shrubs dominate this site, with burrobush (Ambrosia dumosa) dominant, and creosote bush (Larrea tridentata) co-dominant. A high diversity of secondary shrubs and subshrubs are present, and perennial grasses contribute a minor component. This site has similar properties to R030XB139CA, but it has additional moisture (lower solar radiation index, higher precipitation zone, or landscape position), which allows for greater total production and an increase in the importance of burrobrush.

The data in the following sections is from major (15% of map unit or greater) components only.

Associated sites

R030XB005NV	**Arid Active Alluvial Fans** This ecological site occurs on adjacent fan aprons. Creosote bush (Larrea tridentata) and burrobush (Ambrosia dumosa) are co-dominant.
R030XB077NV	**STEEP SOUTH SLOPE** This ecological site occurs on adjacent south-facing slopes. Brittlebush (Encelia farinosa) and creosote bush (Larrea tridentata) are dominant.
R030XB136CA	**Dry Wash** This ecological site occurs on adjacent ephemeral drainageways. Burrobrush (Hymenoclea salsola) and creosote bush (Larrea tridentata) are dominant.
R030XB139CA	**Shallow Dry Hill 4-6 P.Z.** This ecological site occurs on adjacent slopes with less available moisture. Creosote bush (Larrea tridentata) is dominant.
R030XB148CA	**Sandy Plain** This ecological site is found on adjacent fan aprons on fan remnants. Big galleta (Pleuraphis rigida) and Creosote bush (Larrea tridentata) are dominant species.
R030XB189CA	**Shallow Cool Hills** This ecological site occurs on adjacent slopes with a cool thermic soil temperature regime. Blackbrush (Coleogyne ramosissima) dominates and California juniper (Juniperus californica) is typically an important secondary species.
R030XB225CA	**Warm Sloping Pediments** This ecological site occurs on adjacent dissected pediments. Hall's shrubby spurge (Tetracoccus hallii) and burrobush (Ambrosia dumosa) are dominant.
R030XD003CA	**Hyperthermic Steep South Slopes** This ecological site occurs on adjacent, hyperthermic, typically south-facing slopes. Brittlebush (Encelia farinosa) is dominant.
R030XD040CA	**Hyperthermic Steep North Slopes** This ecological site occurs on adjacent, hyperthermic, typically north-facing slopes. Burrobush (Ambrosia dumosa) and Parish's goldeneye (Vigueira parishii) are important species.

R030XY128CA	**Broad, Gravelly, Hyperthermic Ephemeral Stream** This ecological site occurs in medium-sized drainageways adjacent to this site. Desert lavender (Hyptis emoryi), creosote bush (Larrea tridentata) and burrobrush (Hymenoclea salsola) are dominant species.

Similar sites

R030XB001NV	**LIMY HILL 5-7 P.Z.** This ecological site is similar, but receives a greater proportion of summer precipitation. Big galleta (Pleuraphis rigida) and low woollygrass (Dasyochloa pulchella) are the dominant grasses.
R030XB193CA	**Very Shallow To Moderately Deep Gravelly Slopes** This ecological site occurs on soils with an argillic horizon. Shrub diversity is higher, with burrobush (Ambrosia dumosa), Nevada ephedra (Ephedra nevadensis), Parish's goldeneye (Viguiera parishii), jojoba (Simmondsia chinensis) and waterjacket (Lycium andersonii) all important species.
R030XB139CA	**Shallow Dry Hill 4-6 P.Z.** This ecological site has less available moisture. Production is lower, and burrobush (Ambrosia dumosa) is a minor species.
R030XD001CA	**Hyperthermic Dry Hills** This ecological site occurs on slopes with a hyperthermic soil temperature regime. Shrub pecies composition is similar, but production is lower, and there is a negligible grass component.
R030XB146CA	**Volcanic Hill 5-7" P.Z.** This ecological site occurs on slopes with volcanic parent material. Eastern Mojave buckwheat (Eriogonum fasciculatum) and burrobush (Ambrosia dumosa) are co-dominant.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Ambrosia dumosa* (2) *Larrea tridentata*
Herbaceous	(1) *Achnatherum speciosum*

Physiographic features

This site occurs on sideslopes of fan remnants, hills and mountains on all exposures. Elevations range from 1800 to 5100 feet. Slopes may range from 2 to 75 percent, but slope gradients of 15 to 50 percent are most typical. Runoff class is low to very high.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Mountain slope (3) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	549–1,554 m
Slope	2–75%
Aspect	Aspect is not a significant factor

Climatic features

The climate on this site is arid, and characterized by cool, somewhat moist winters and hot, dry summers. The average annual precipitation ranges from 3 to 8 inches with most falling as rain from November to March with a secondary, smaller peak following summer convection storms from July to September. Mean annual air temperature is 55 to 70 degrees F. The frost free period is 200 to 320 days. Freeze free period was not entered and defaults to zero.

Table 3. Representative climatic features

Frost-free period (average)	320 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 typically very shallow to shallow over bedrock or a duripan, but soils may be very deep. Soils are typically loamy-skeletal or loamy in the particle control section. Surface textures are typically very to extremely gravelly or cobbly loamy sand and loam. Subsurface textures are typically loam, sandy loam, sandy clay loam and loamy sand with gravelly, stony and cobbly modifiers. These soils are well to excessively drained with very slow to moderately rapid permeability. The soils associated with this ecological site occur on mountain and hillslopes and formed from colluvium over residuum weathered from granite, mixed sources, gneiss, metamorphic rock, igneous rock, sandstone, siltstone and shale; or soils occur on steep sideslopes of fan remnants, and formed in alluvium derived from granite, gneiss, igneous rock, and mixed sources.

The associated soil series that are 15 percent or greater of any one map unit are:

Yuccabutte (Loamy-skeletal, mixed, superactive, thermic Typic Haplargids);
Crosgrain (Loamy-skeletal, mixed, superactive, thermic, shallow Typic Haplodurids);
Dime (Loamy-skeletal, mixed, superactive, thermic Typic Haplocalcids);
Fourcorners (Loamy-skeletal, mixed, superactive, thermic, shallow Typic Argidurids);
Shankba (Loamy-skeletal, mixed, superactive, calcareous, thermic, shallow Typic Torriorthents);
Xyzoic (Loamy-skeletal, mixed, superactive, calcareous, thermic, shallow Typic Torriorthents);
Crackerjack (Loamy, mixed, superactive, thermic, shallow Cambidic Haplodurids):
Fortirwin (Loamy, mixed, superactive, thermic, shallow Typic Argidurids):
Dalvord (Loamy-skeletal, mixed, superactive, calcareous, thermic Lithic Torriorthents);
Coyote (Sandy, mixed, thermic Durinodic Haplocalcids);
Pacific Mesa (Loamy-skeletal, mixed, superactive, thermic Lithic Haplocambids);
Coppermine (Loamy-skeletal, mixed, superactive, thermic, shallow Typic Haplargids);
Nellake (Loamy-skeletal, mixed, superactive, thermic Typic Haplargids);
Paintrocks (Loamy-skeletal, mixed, superactive, calcareous, thermic Lithic Torriorthents);
Desertqueen (Loamy, mixed, superactive, thermic, shallow Typic Haplargids);
Silvermine (Sandy, mixed, thermic, shallow Cambidic Haplodurids);
Langwell (Loamy, mixed, superactive, calcareous, thermic Lithic Torriorthents);
Seanna (Loamy-skeletal, mixed, superactive, calcareous, thermic, shallow Typic Torriorthents);
Artillery (Loamy-skeletal, mixed, superactive, thermic Lithic Haplargids);
Minhoyt (Loamy, mixed, superactive, thermic, shallow Typic Haplodurids);
Noble Pass (Loamy-skeletal, mixed, superactive, calcareous, thermic Lithic Torriorthents);
Contactmine (Fine-loamy, mixed, superactive, thermic Typic Haplargids);
Grubstake (Loamy, mixed, superactive, thermic, shallow, Typic Haplocambids);
Hexie (Coarse-loamy, mixed, superactive, thermic, Typic Haplargids).

This ecological site is also correlated with minor components (less than 15% of a mapunit). This information can be requested from NRCS.

This ecological site is correlated with the following soil survey areas, map units and soil components (Soil survey area; Mapunit symbol; Mapunit name; Component; phase; percent in alphabetical order by soil component):

CA794 Joshua Tree National Park, California
CA794; 1241;Meccapass-Seanna-Contactmine complex, 15 to 75 percent slopes; Seanna;;20;Contactmine;dry;20
CA794; 3295;Desertqueen-Hexie-Rock outcrop, 15 to 50 percent slopes;Contactmine;dry;3
CA794; 3297;Desertqueen-Contactmine-Seanna complex, 8 to 30 percent slopes; Desertqueen;warm;40;

Contactmine;dry;20
CA794; 3340;Seanna-Grubstake-Pinecity complex, 30 to 75 percent slopes; Pacific Mesa;steep;65; Grubstake;moist;20; Seanna;;35; Seanna;;10; Contactmine;dry;4
CA794; 3110;Coppermine-Stranger complex, 8 to 50 percent slopes;Coppermine;cool;40; Typic Petrocalcids;;7
CA794; 4620;Stranger-Rock outcrop-Grubstake complex, 8 to 50 percent slopes;Grubstake;moist;20
CA794; 4830;Rock outcrop-Pinecity complex, 8 to 30 percent slopes;Grubstake;moist;2
CA794; 3120;Aguilareal-Rock outcrop-Blackeagle complex, 30 to 60 percent slopes;Lithic Haplocalcids;;3
CA794;4285;Typic Argidurids-Coppermine-Minhoyt complex, 4 to 30 percent slopes;Minhoyt;warm;25;Typic Argidurids;;35
CA794; 1240;Meccapass-Bulletproof-Rock outcrop complex, 30 to 75 percent slopes;Seanna;;5
CA794; 4041;Silvermine-Helendale-Burntshack association, 1 to 15 percent slopes;Silvermine;;40
CA794;4270;Yuccabutte extremely cobbly sandy loam, 8 to 30 percent slopes;Yuccabutte;extremely cobbly sandy loam;95
CA794; 4271;Yuccabutte-Arizo association, 2 to `5 percent slopes;Yuccabutte;steep;1

CA698 Mojave Desert Area, West Central Part, California
CA698;JIB1;Coppermine-Rock Outcrop Association, 8 to 60 percent slopes; Coppermine;;60;Coppermine;;5; Typic Haplocalcids;;5
CA698;JIB20;Coppermine-Hexie-Rock Outcrop Association, 8 to 60 percent slopes;Coppermine;;55; Coppermine;;10; Hexie;;20; Jiblette;;5

CA803 Colorado Desert Area, California
CA803;1240;Meccapass-Bulletproof-Rock outcrop complex, 30 to 75 percent slopes;Seanna;;5

CA697 National Training Center, Fort Irwin, California
CA697;415;Nellake-Arizo association, 4 to 15 percent slopes;Arizo;;35
CA697;105;Langwell-Artillery-Rock outcrop association, 8 to 30 percent slopes;Artillery;;30
CA697;245;Dalvord-Rock outcrop-Langwell complex, 15 to 50 percent slopes;Artillery;;5
CA697;350;Twobitter-Langwell complex, 4 to 15 percent slopes;Artillery;;3
CA697;540;Dalvord-Rock outcrop association, 15 to 50 percent slopes;Artillery;;5
CA697;114;Crosgrain complex, 2 to 8 percent slopes;Cambidic Haplodurids;;5
CA697;251;Cajon-Hollyhills-Spider association, 2 to 15 percent slopes;Coyote;;5
CA697;341;Coyote-Cronese complex, 2 to 30 percent slopes;Coyote;;65
CA697;130;Dime extremely gravelly coarse sandy loam, 4 to 30 percent slopes;Crackerjack;;5
CA697;211;Cavespring-Arizo-Cavespring very cobbly complex, 2 to 15 percent slopes;Crackerjack;;4
CA697;212;Cavespring very cobbly sandy loam, 15 to 30 percent slopes;Crackerjack;;5
CA697;227;Arizo-Luckyfuse-Fortirwin association, 2 to 8 percent slopes;Crackerjack;;5
CA697;261;Crosgrain-Fortirwin complex, 2 to 8 percent slopes;Crackerjack;;3
CA697;321;Fortirwin extremely cobbly loam, 4 to 15 percent slopes;Crackerjack;;4
CA697;480;Luckyfuse-Crackerjack association, 2 to 15 percent slopes;Crackerjack;;40
CA697;481;Luckyfuse-Arizo association, 2 to 4 percent slopes;Crackerjack;;10
CA697;490;Owlshead extremely gravelly sandy loam, 2 to 8 percent slopes;Crackerjack;;4
CA697;500;Crackerjack extremely gravelly sandy loam, 4 to 15 percent slopes;Crackerjack;;80
CA697;501;Crackerjack-Fortirwin association, 2 to 15 percent slopes;Crackerjack;;55
CA697;504;Crackerjack extremely gravelly sandy loam, 2 to 8 percent slopes;Crackerjack;;3
CA697;505;Crackerjack-Owlshead association, 8 to 30 percent slopes;Crackerjack;;45
CA697;550;Carrizo-Clegorpass-Carrizo frequently flooded association, 2 to 8 percent slopes;Crackerjack;;5
CA697;339;Eastrange-Dime association, 8 to 50 percent slopes;Cronese;;5
CA697;109;Juratrias-crosgrain association, 15 to 50 percent slopes;Crosgrain;;25
CA697;110;Crosgrain extremely gravelly loam, 8 to 30 percent slopes;Crosgrain;;85
CA697;111;Crosgrain-Twobitter association, 4 to 30 percent slopes;Crosgrain;;50
CA697;113;Crosgrain-Popups complex, 4 t0 15 percent slopes;Crosgrain;;45
CA697;121;Dalvord association, 15 to 50 percent slopes;Crosgrain;VERY GRAVELLY SANDY LOAM;5
CA697;200;Fourcorners extremely gravelly sandy loam, 4 to 30 percent slopes;Crosgrain;;2
CA697;211;Cavespring-Arizo-Cavespring very cobbly complex, 2 to 15 percent slopes;Crosgrain;;2
CA697;222;Arizo-Twobitter association, 2 to 8 percent slopes;Crosgrain;;1
CA697;310;Fortirwin-Crosgrain association, 2 to 15 percent slopes;Crosgrain;;25
CA697;339;Eastrange-Dime association, 8 to 50 percent slopes;Crosgrain;;2

CA697;450;Werewolf-Arizo association, 2 to 8 percent slopes;Crosgrain;;7
CA697;460;Lanip family, 2 to 8 percent slopes;Crosgrain;;3
CA697;470;Noble Pass-Rock outcrop association, 30 to 75 percent slopes;Crosgrain;;4
CA697;500;Crackerjack extremely gravelly sandy loam, 4 to 15 percent slopes;Crosgrain;;3
CA697;505;Crackerjack-Owlshead association, 8 to 30 percent slopes;Crosgrain;;1
CA697;105;Langwell-Artillery-Rock outcrop association, 8 to 30 percent slopes;Dalvord;;8
CA697;120;Dalvord-Angelpoint-Rock outcrop association, 30 to 75 percent slopes;Dalvord;;45
CA697;121;Dalvord association, 15 to 50 percent slopes;Dalvord;;25
CA697;122;Dalvord-Etinarg association, 15 to 50 percent slopes;Dalvord;EXTREMELY COBBLY;20
CA697;200;Fourcorners extremely gravelly sandy loam, 4 to 30 percent slopes;Dalvord;;3
CA697;245;Dalvord-Rock outcrop-Langwell complex, 15 to 50 percent slopes;Dalvord;;40
CA697;246;Rock outcrop-Etinarg association, 8 to 30 percent slopes;Dalvord;;4
CA697;256;Rock outcrop-Paintrocks complex, 15 to 50 percent slopes;Dalvord;;4
CA697;257;Paintrocks-Rock outcrop complex, 15 to 50 percent slopes;Dalvord;;4
CA697;415;Nellake-Arizo association, 4 to 15 percent slopes;Dalvord;;6
CA697;530;Xyzoic extremely gravelly sandy loam, 15 to 50 percent slopes;Dalvord;;5
CA697;540;Dalvord-Rock outcrop association, 15 to 50 percent slopes;Dalvord;;70
CA697;105;Langwell-Artillery-Rock outcrop association, 8 to 30 percent slopes;Dime;;3
CA697;130;Dime extremely gravelly coarse sandy loam, 4 to 30 percent slopes;Dime;;85
CA697;339;Eastrange-Dime association, 8 to 50 percent slopes;Dime;;35
CA697;360;Twobitter-Arizo association, 2 to 8 percent slopes;Dime;;4
CA697;393;Gravesumit-Thermopyl complex, 2 to 4 percent slopes;Dime;;2
CA697;502;Crackerjack-Dime association, 8 to 50 percent slopes;Dime;;40
CA697;321;Fortirwin extremely cobbly loam, 4 to 15 percent slopes;Fortirwin;;80
CA697;200;Fourcorners extremely gravelly sandy loam, 4 to 30 percent slopes;Fourcorners;;85
CA697;105;Langwell-Artillery-Rock outcrop association, 8 to 30 percent slopes;Langwell;;35
CA697;245;Dalvord-Rock outcrop-Langwell complex, 15 to 50 percent slopes;Langwell;;15
CA697;250;Cajon-Paintrocks-Langwell association, 2 to 8 percent slopes;Langwell;;15
CA697;255;Paintrocks-Rock outcrop complex, 4 to 15 percent slopes;Langwell;;5
CA697;256;Rock outcrop-Paintrocks complex, 15 to 50 percent slopes;Langwell;;5
CA697;257;Paintrocks-Rock outcrop complex, 15 to 50 percent slopes;Langwell;;5
CA697;350;Twobitter-Langwell complex, 4 to 15 percent slopes;Langwell;;25
CA697;393;Gravesumit-Thermopyl complex, 2 to 4 percent slopes;Langwell;;5
CA697;200;Fourcorners extremely gravelly sandy loam, 4 to 30 percent slopes;Nellake;;3
CA697;339;Eastrange-Dime association, 8 to 50 percent slopes;Nellake;;2
CA697;415;Nellake-Arizo association, 4 to 15 percent slopes;Nellake;;50
CA697;540;Dalvord-Rock outcrop association, 15 to 50 percent slopes;Nellake;;5
CA697;470;Noble Pass-Rock outcrop association, 30 to 75 percent slopes;Newera;;5
CA697;102;Mulespring-Newera-Noble Pass association, 15 to 75 percent slopes;Noble Pass;extremely gravelly sandy loam;15
CA697;181;Stonegold extremely cobbly loam, 2 to 8 percent slopes;Noble Pass;;8
CA697;212;Cavespring very cobbly sandy loam, 15 to 30 percent slopes;Noble Pass;;3
CA697;471;Noble Pass complex, 8 to 30 percent slopes;Noble Pass;;25
CA697;255;Paintrocks-Rock outcrop complex, 4 to 15 percent slopes;Paintrocks;;45
CA697;415;Nellake-Arizo association, 4 to 15 percent slopes;Paintrocks;;2
CA697;103;Shankba family, 30 to 75 percent slopes;Shankba family;;85
CA697;471;Noble Pass complex, 8 to 30 percent slopes;Typic Calciargids;;6
CA697;121;Dalvord association, 15 to 50 percent slopes;Typic Haplargids;EXTREMELY STONY SANDY LOAM;6
CA697;530;Xyzoic extremely gravelly sandy loam, 15 to 50 percent slopes;Xyzoic;;85

Table 4. Representative soil features

Parent material	(1) Alluvium–granite (2) Colluvium–granite (3) Residuum–granite

Surface texture	(1) Extremely gravelly sandy loam (2) Extremely gravelly loam (3) Extremely cobbly loam
Family particle size	(1) Loamy
Drainage class	Well drained to excessively drained
Permeability class	Very slow to moderately rapid
Soil depth	3 cm
Surface fragment cover <=3"	0–90%
Surface fragment cover >3"	0–50%
Available water capacity (0-101.6cm)	0.25–12.95 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	6.1–9.4
Subsurface fragment volume <=3" (Depth not specified)	8–90%
Subsurface fragment volume >3" (Depth not specified)	0–15%

Ecological dynamics

Abiotic Factors

This site occurs on steep sideslopes of fan remnants, hillslopes and mountains on all exposures. Slope gradients of 15 to 50 percent are typical. Soils range from very shallow to very deep. This site occurs on slopes that are too warm and/or too dry to support blackbrush (*Coleogyne ramosissima*), but that retain sufficient moisture during the winter growing season to support the shallow-rooted burrobush.

Disturbance Dynamics

The disturbances impacting this ecological site include drought, invasion by non-native species and fire.

Desert regions are characterized by low mean annual precipitation and extreme variability in the amount of precipitation received in any year or decade (Hereford et al. 2006). Thus, episodic mortality in response to periods of drought is important in shaping desert community dynamics (Hereford et al. 2006, Miriti et al. 2007). Short-lived perennial shrubs demonstrate the highest rates of mortality (Webb et al. 2003, Bowers 2005, Hereford et al. 2006, Miriti et al. 2007), and annual species remain dormant in the soil seedbank (Beatley 1969, 1974, 1976). Long-lived shrubs and trees 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.

Non-native annual species such as red brome (*Bromus rubens*), Mediterranean grass (*Schismus barbatus*), redstem stork’s bill (*Erodium cicutarium*) and Asian mustard (*Brassica tournefortii*) 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). Like native annuals, nonnative annual cover and production is directly related to winter precipitation (Beatley 1969, Brooks and Berry 2006, Barrows et al. 2009). Steep slopes and rocky soils reduce the availability of soil moisture on this site, limiting biomass of annual species.

Invasion by non-native annual grasses has increased the flammability of Mojave Desert vegetation 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). The low potential for high biomass of annual species limits the continuity of fine fuels in this site, and reduces the susceptibility of this site to fire. However, during very wet years native annuals may reach high biomass, and since this site occurs on steep slopes over which fire may rapidly move, this site may burn during conditions of extreme fire behavior. In the rare event that this ecological site does burn, a burrobush dominated community recovers relatively rapidly, and although creosote bush communities may take decades to recover to pre-burn stature (Brown and Minnich , Engel and Abella 2011), the expanse of the creosote seedbank on surrounding landforms means that this ecological site is not considered at risk of transitioning to a fire-altered State.

State and transition model

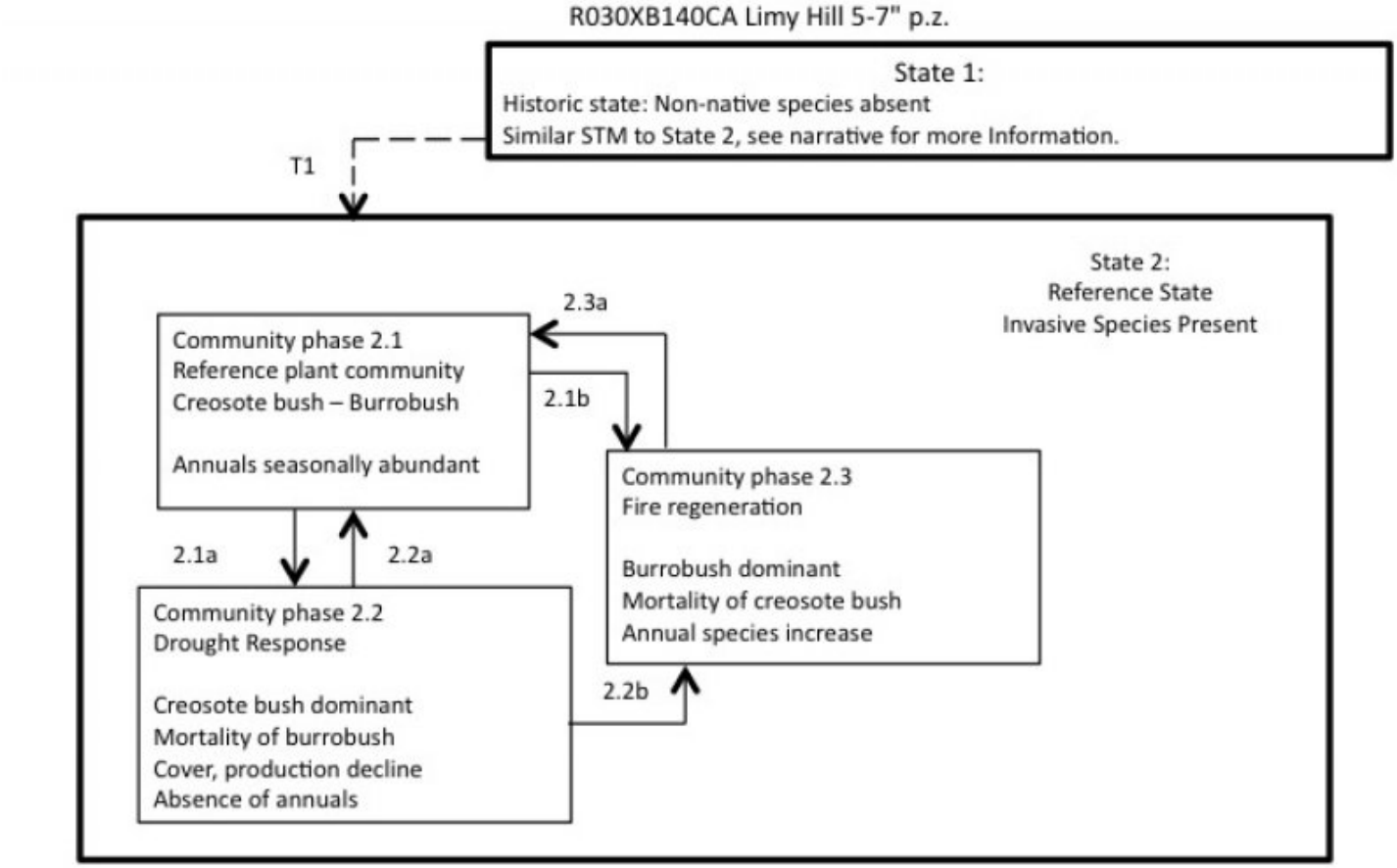

Figure 3. R030XB140CA

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 and Colorado Deserts. 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 Mediterranean grass (*Schismus barbatus*) are naturalized in this plant community. Abundance varies with precipitation, but it is at least sparsely present (as current year's growth or present in the soil seedbank).

Community 2.1
Reference Plant Community

Figure 4. Community Phase 2.1

The reference plant community is characterized by widely spaced shrubs, 0.5 to 2 meters tall. Burrobush dominates, and creosote bush is a co-dominant species. A wide diversity of secondary shrubs may be present. Common species include white ratany (*Krameria grayi*), range ratany (*Krameria erecta*), Nevada jointfir (*Ephedra nevadensis*), and Mojave yucca (*Yucca schidigera*). Cactus species are typically present, and include Englemann's hedgehog cactus (Echinocerus engelmannii), branched pencil cholla (*Cylindropuntia ramosissima*), Wiggins' cholla (Cylindropuntia echninocarpa), beavertail cholla (*Opuntia basilaris*), and cottontop cactus (*Echinocactus polycephalus*). Subshrubs may make a significant contribution to annual production, and common species include Mojave aster (*Xylorhiza tortifolia*), wishbone bush (*Mirabilis laevis* var. villosa), brownplume wirelettuce (*Stephanomeria pauciflora*), desert trumpet (*Eriogonum fasciculatum*), and desert pepperweed (*Lepidium fremontii*). Perennial grasses are present at low levels, including big galleta (*Pleuraphis rigida*), desert needlegrass (*Achnatherum speciosum*), Indian ricegrass (*Achnatherum hymenoides*) and low woollygrass (*Dasyochloa pulchella*). The composition and abundance of annual vegetation differs from year to year, depending on the time and amount of precipitation. Common species include pincushion flower (*Chaenactis fremontii*), bristey fiddleneck (*Amsinckia tessellata*), curvenut combseed (*Pectocarya recurvata*), and smooth desert dandelion (*Malacothrix glabrata*), although many other species may be present. Pockets of cryptogamic crust have developed between the surface rock and vegetation. The non-native annual forb redstem stork's bill may be abundant, and the non-native annual grasses red brome and Mediterranean grass are often sparsely present.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	185	276	368
Forb	–	71	168
Grass/Grasslike	–	6	62
Tree	–	–	11
Total	**185**	**353**	**609**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	8-15%
Grass/grasslike foliar cover	2-3%

Forb foliar cover	1-2%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Figure 6. Plant community growth curve (percent production by month). CA3004, Burrobush XB. Growth starts in early spring, flowering and seed set occur by July. Dormancy occurs during the hot summer months. With sufficient summer/fall precipitation, some vegetation may break dormancy and produce a flush of new growth..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	5	25	35	20	0	0	10	5	0	0	0

Figure 7. Plant community growth curve (percent production by month). CA3015, Creosote bush XB. Growth starts in early spring with flowering and seed set occurring by July. Dormancy occurs during the hot summer months. With sufficient summer/fall precipitation, some vegetation may break dormancy and produce a flush of growth..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	5	20	30	20	10	0	10	5	0	0	0

Figure 8. Plant community growth curve (percent production by month). CA3087, Desert needlegrass. Growth begins in mid-winter and continues through summer, setting seed in late summer..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	5	15	25	20	15	15	5	0	0	0	0

Community 2.2
Drought Response

This community phase is characterized by an overall decline in cover due branch-pruning and lack of recruitment of creosote bush, mortality of burrobush, and lack of emergence of annual forbs. Creosote bush becomes more important in the drought response phase, with mortality of burrobush and other shorter lived species.

Community 2.3
Fire Regeneration Community

This community phase is characterized by the loss or severe decline of creosote bush from the plant community, since creosote bush is typically killed by fire (Brown and Minnich 1986). Burrobush has limited sprouting ability following fire, but relatively rapidly colonizes disturbed areas from adjacent seed sources, and will dominate the fire regeneration community. Native perennial forbs, perennial grasses, and annual forbs will initially increase. Species capable of resprouting after fire become more important, including Mojave yucca, range ratany, white ratany, and Nevada jointfir. By 19-20 years post-fire there is sparse cover of creosote bush and other secondary shrubs in burned communities (Engel and Abella 2011, Steers and Allen 2011).

Pathway 2.1a

Community 2.1 to 2.2

This pathway occurs with prolonged or severe drought.

Pathway 2.1b
Community 2.1 to 2.3

This pathway occurs with moderate to severe fire.

Pathway 2.2a
Community 2.2 to 2.1

This pathway occurs with time and a return to average or above average climatic conditions.

Pathway 2.2b
Community 2.2 to 2.3

This pathway occurs with moderate to severe fire, and takes place within one years of a very wet period when standing annual forb and grass biomass is still present.

Pathway 2.3a
Community 2.3 to 2.1

This community pathway occurs with time and an absence of additional disturbance.

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 Southwest Desert region in the 1860s.

Additional community tables

Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
1	**Native shrubs**			185–368	
	burrobush	AMDU2	*Ambrosia dumosa*	34–336	4–22
	white ratany	KRGR	*Krameria grayi*	34–336	0–4
	creosote bush	LATR2	*Larrea tridentata*	19–93	1–8
	Nevada jointfir	EPNE	*Ephedra nevadensis*	4–58	1–3
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	0–58	0–3
	spiny hopsage	GRSP	*Grayia spinosa*	0–58	0–3
	Mojave yucca	YUSC2	*Yucca schidigera*	3–58	1–3
	cottontop cactus	ECPO2	*Echinocactus polycephalus*	0–58	0–2
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	0–48	0–2
	water jacket	LYAN	*Lycium andersonii*	0–20	0–1
	littleleaf ratany	KRER	*Krameria erecta*	8–19	0–1
	sweetbush	BEJU	*Bebbia juncea*	0–12	0–1
	Wiggins' cholla	CYEC3	*Cylindropuntia echinocarpa*	0–9	0–1
	brittlebush	ENFA	*Encelia farinosa*	0–6	0–1

	beavertail pricklypear	OPBA2	*Opuntia basilaris*	0–6	0–1
	Trans-Pecos false clapdaisy	PSAR	*Pseudoclappia arenaria*	0–4	0–1
	jojoba	SICH	*Simmondsia chinensis*	0–4	0–1
	branched pencil cholla	CYRA9	*Cylindropuntia ramosissima*	0–4	0–1
Tree					
2	**Trees**			0–11	
	Joshua tree	YUBR	*Yucca brevifolia*	0–11	0–1
Forb					
3	**Native Annual Forbs**			0–62	
	desert Indianwheat	PLOV	*Plantago ovata*	0–39	0–4
	pincushion flower	CHFR	*Chaenactis fremontii*	0–34	0–3
	smooth desertdandelion	MAGL3	*Malacothrix glabrata*	0–18	0–2
	curvenut combseed	PERE	*Pectocarya recurvata*	0–18	0–2
	miniature woollystar	ERDI2	*Eriastrum diffusum*	0–15	0–1
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	0–13	0–1
4	**Native Perennial Forbs**			0–112	
	desert pepperweed	LEFR2	*Lepidium fremontii*	0–56	0–2
	Mojave woodyaster	XYTO2	*Xylorhiza tortifolia*	0–56	0–2
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	3–34	0–2
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	0–34	0–2
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–34	0–2
	wishbone-bush	MILAV	*Mirabilis laevis var. villosa*	0–34	0–1
6	**Non-native annual forbs**			0–141	
	redstem stork's bill	ERCI6	*Erodium cicutarium*	0–141	0–12
Grass/Grasslike					
5	**Native Perennial Grasses**			0–62	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–39	0–2
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–34	0–2
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–34	0–2
	big galleta	PLRI3	*Pleuraphis rigida*	0–19	0–2
7	**Non-native annual grasses**			0–2	
	red brome	BRRU2	*Bromus rubens*	0–1	0–1
	common Mediterranean grass	SCBA	*Schismus barbatus*	0–1	0–1

Animal community

Mammals occurring on this site include desert woodrats, deer mice, black-tailed jackrabbits, antelope ground squirrels and pocket mice. Many small mammals browse creosotebush and consume its seeds. Feral burros also occur on this site.

Reptiles occurring on this site include desert horned lizards, desert collared lizards and chuckwallas. Depth to bedrock or a duripan is a restrictive feature to burrowing reptiles, such as the desert tortoise, although tortoise have been documented on this site.

Birds occurring on this site include chukars, black-throated and sage sparrows, rock wrens and common ravens.

LIVESTOCK GRAZING:
This site has limited use for livestock grazing due to the steep rocky slopes and low productivity. Burrobush is fair browse for cattle and horses, and fair to good browse for sheep. Burrobush is one of the major forage species of feral burros, especially in winter. Feral burros can eliminate this shrub through browsing and trampling. Creosote bush is unpalatable to livestock.

Recreational uses

This site is highly valued for open space and those interested in desert ecology. Flowering wildflowers and shrubs may also attract visitors during the spring.

Other information

Military Operations - The steep rocky slopes restrict extensive vehicle and foot traffic. Management for this site would be to protect it from excessive disturbance and maintain existing plant cover. Disturbance of the cryptogamic crust may result in increased soil erosion. Land clearing or other disturbances that destroy the vegetation and the soil crust and structure can result in soil compaction, reduced infiltration rates, accelerated erosion, soil blowing and barren areas.

Inventory data references

Sampling technique

12_ NV-ECS-1
_3_ SCS-Range 417
25+ Other

CA794 Inventory Plots:
1249740011
12497040008
011311_01
COSP-05
COSP-07
COSP09
FRWA-04
FRWA-07
MVAL-3
POWA46
WAWA-02

Type locality

Location 1: San Bernardino County, CA	
Township/Range/Section	T12N R2E S2
UTM zone	N
UTM northing	3891391
UTM easting	0524120
General legal description	NE1/4 Sec 2, T12N R2E Approximately 7 miles southwest of Fort Irwin, CA Langford Well Quadrangle UTM 11S 0524120e 3891391n (Datum=NAS-C) San Bernardino Co., CA

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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)	P.Novak-Echenique
Contact for lead author	State Rangeland Management Specialist
Date	07/14/2009
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are none. Rock fragments armor the soil surface against erosion.

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2. **Presence of water flow patterns:** Water flow patterns are none to rare. A few may on steeper slopes (short <1m) after summer convection storms.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals and terracettes are none.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is variable (15-25%), depending on amount of surface rock fragments.

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5. **Number of gullies and erosion associated with gullies:** None. Natural drainages may be observed on steeper side slopes.

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter typically remains in place. Fine litter (foliage from grasses and annual and perennial forbs) may move the distance of slope length (<10 ft) during intense summer convection storms or rapid snowmelt events. Persistent litter (large woody material) will remain in place expect

during large rainfall events.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability values should be 3 to 6 depending on soil textures and canopy cover. (To be field tested.)

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is typically weak thin to medium platy. Soil surface colors are light and the soils have an ochric epipedon. Organic matter of the surface 2 to 3 inches is less than 1 percent.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Sparse shrub canopy (10-15%) and associated litter provide some protection from raindrop impact.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Subangular blocky structure, calcic or petrocalcic horizons are not to be interpreted as compacted layers.

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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: white bursage > creosotebush > associated desert shrubs >

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

    Other: succulents, microbiotic crusts

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs are common and standing dead shrub canopy material may be as much as 25% of total woody canopy.

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14. **Average percent litter cover (%) and depth (in):** Between plant interspaces 5-15% and depth of litter is ±¼ inch. Litter is concentrated under shrubs and generally stays in place.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season ~250 lbs/ac. Favorable years ±350 lbs/ac and unfavorable years ±100 lbs/ac.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if**

their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: Red brome, red-stem filaree, mustards, and Mediterranean grass are potential invaders on this site.

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17. **Perennial plant reproductive capability:** All functional groups should reproduce in average and above-average rainfall years. Little growth and reproduction occurs during extreme drought and extended drought periods.
