Ecological site R040XD202CA
Stony, Occasionally Flooded Ephemeral Stream

Accessed: 05/09/2024

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): 040X–Sonoran Basin and Range

MLRA Statement:
Major land resource area (MLRA) 31 is the Lower Colorado Desert. This area is in the extreme southeastern part of California, in areas along the Colorado River, and in Western Arizona. The area is comprised of rough, barren, steep, and strongly dissected mountain ranges, generally northwest to southwest trending that are separated by intermontane basins. Elevation ranges from approximately 275 feet below sea level at the lowest point in the Salton Trough to 2700 feet along low northwest to southeast trending mountain ranges. The average annual precipitation is 2 to 6 inches with high temporal and spatial variability. Winter temperatures are mild, summer temperatures are hot, and seasonal and diurnal temperature fluctuations are large. Monthly minimum temperature averages range from 40 to 80 degrees F (4 to 27 degrees C). Monthly maximum temperature averages range from 65 to 110 degrees F (18 to 43 degrees C) (WRCC 2002). Temperatures are rarely below 28 degrees F, and extremely rarely fall below 24 degrees F. Precipitation is bimodal, with approximately 20 to 40 percent of annual precipitation falling between July and September. This summer rainfall, in combination with very hot temperatures and very few to no days of hard freeze are what characterize this MLRA and distinguish it from the Mojave Desert (MLRA 30).

Site Concept:
This ecological site occurs on stony, inset fans among cobbly fan remnants. This site primarily receives run off from adjacent fan remnants, but may also receive divergent flow from larger drainages above. Elevations range from 1130 to 2890 feet, with slopes of 4 to 15 percent. Soil surfaces are cobbly to stony. Blue paloverde (Parkinsonia florida) is dominant, and desert lavender (Hyptis emoryi) and Schott's dalea (Psorothamnus schottii) are important species. The additional run-on provided by the rocky surfaces of both the inset fans and fan remnants supports high cover of blue paloverde, and is favored habitat for desert lavender and Schott's dalea.

Data ranges in the physiographic data, climate data, water features, and soil data sections of this Ecological Site Description are based on major and minor components, since it is often only associated with minor components.

Associated sites

R040XD034CA	**Gravelly, Braided, Ephemeral Stream** This ecological site is on large braided drainageways, with burrobush and desert lavender dominant.
R040XD200CA	**Rarely Flooded Fans** This ecological site is on rarely flooded fan aprons, fan remnants, and inset fans. It is dominated by brittlebush and creosote bush, and does not have a cobbly or stony surface.

R040XD201CA	**Cobbly Fan Remnants** This ecological site is on rarely flooded ran remnants with a cobbly surface. Brittle brush, creosote bush and cacti are present.

Table 1. Dominant plant species

Tree	(1) *Parkinsonia florida*
Shrub	(1) *Hyptis emoryi* (2) *Psorothamnus schottii*
Herbaceous	Not specified

Physiographic features

This ecological site occurs on occasionally flooded inset fans. Elevations range from 1130 to 2890 feet, and slopes range from 4 to 15 percent.

Table 2. Representative physiographic features

Landforms	(1) Inset fan
Flooding duration	Extremely brief (0.1 to 4 hours)
Flooding frequency	None to occasional
Ponding frequency	None
Elevation	344–881 m
Slope	4–15%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this ecological site is characterized by hot temperatures, aridity, and a bimodal precipitation pattern. Precipitation falls as rain, with 30 percent falling in summer between July and October, and 60 percent falling in winter between November and March. The mean annual precipitation is 2 to 4 inches, and mean annual air temperature is 73 to 79 degrees F. The frost free period is 360 to 365 days, and freeze free period is 363 to 365 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):

42598, Eagle Mountain, CA (Period of record = 1933 to 2011) [2]

43855, Hayfield Reservoir, CA (Period of record = 1933 to 2011) [1]

The data from multiple weather were combined to most accurately reflect the climatic conditions of this ecological site.

Table 3. Representative climatic features

Frost-free period (average)	364 days
Freeze-free period (average)	362 days
Precipitation total (average)	76 mm

Influencing water features

This site is subject to occasional flash-flood events.

Soil features

The soils associated with this ecological site are very deep, excessively drained and formed in alluvium from granite and gneiss or igneous rock. The surface textures are gravelly loamy coarse sand and extremely gravelly and extremely gravelly coarse sand, with high cover of cobbles and stones. Subsurface horizons are composed of coarse sands and sands, generally with very or extremely gravelly modifiers. Surface rock fragments less than 3 inches range from 40 to 55 percent cover, and fragments greater than 3 inches range from 30 to 37 percent. Subsurface percent by volume of rock fragments less than 3 inches ranges from 25 to 46 percent, and greater that 3 inch rock fragments range from 0 to 14 percent (for a depth of 60 inches).

This ecological site is correlated with the Rizzo soil series. The Rizzo soils are sandy skeletal, mixed, hyperthermic Typic Torriorthents.

The following map units and soil components are associated with this ecological site the Joshua Tree National Park Soil Survey (CA794):

Map unit ID; Map unit name; Component; Phase; Percent
1504; Rizzo association, 4 to 15 percent slopes, rubbly; Rizzo; occasionally flooded, stony; 35
2140; Rockhound silt loam, 4 to 15 percent slopes; Rizzo; occasionally flooded; 5

This ecological site also occurs in the map units listed above in the where this survey joins the Colorado Desert Area Soil Survey (CA803).

Table 4. Representative soil features

Parent material	(1) Alluvium–gneiss
Surface texture	(1) Extremely gravelly coarse sand (2) Gravelly loamy coarse sand
Family particle size	(1) Sandy
Drainage class	Excessively drained
Permeability class	Rapid
Soil depth	152 cm
Surface fragment cover <=3"	40–55%
Surface fragment cover >3"	30–37%
Available water capacity (0-101.6cm)	2.29–4.57 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	25–46%
Subsurface fragment volume >3" (Depth not specified)	0–14%

Ecological dynamics

This ecological site occurs on relatively confined, occasionally flooded, stony, inset fans among cobbly fan remnants. Soil surfaces are stony to cobbly. Blue paloverde is dominant, and desert lavender and Schott's dalea are important species. The additional run-on provided by the rocky surfaces of both the inset fans and fan remnants supports high cover of blue paloverde and is favored habitat for desert lavender and Schott's dalea.

Soil disturbance from flash flood events is the primary driver of plant community dynamics within this ecological site. Ephemeral streams lack permanent flow except in response to rainfall events (Bull 1997, Levick et al. 2008). Physical disturbance of soils as a result of flash flooding makes predictability of temporary channel development and configuration very low except when considered at a very coarse scale. Channel avulsion of the main channel is rare, but it occurred it would cause high mortality of vegetation in the old channel due to water stress, and initiate development of xeroriparian communities in the newly created channel

Channel avulsion is "the diversion of the majority of the surface flow to a different channel, with total or partial abandonment of the original channel" (Field 2001). Because flow in these ephemeral streams is inconsistent in force, volume, and frequency, deposition and scour of sediment varies with each flood event. Changes in sedimentation and erosion alter flow dynamics, potentially redirecting flow to an alternate channel. Cycles of channel avulsion on fan piedmonts is an ongoing and a long-term process in the development of alluvial fans and associated landforms, and can occur after any substantial overland flow event when existing channel capacity is very rapidly and dramatically exceeded. This ecological site generally occurs on the upper to medial positions of a fan piedmont. At the distal reaches, flow dissipates and infiltrates and in the absence of flood disturbance or additional moisture, the inset fans become vegetated with upland creosote bush plant communities.

The drought-tolerant vegetation that exists on ephemeral streams and drainageways is referred to as xeroriparian vegetation. It is distinct from the surrounding landforms due to a difference in species composition, size, and production (Johnson et al. 1984, Levick et al. 2008). Xeroriparian vegetation is present because of the increased availability of water and flood disturbances in these drainageways. Blue paloverde, desert lavender, and Schott's dalea are present along the stony sediment bars. These species are phreatophytes, that is, they have deep roots and primarily rely on a deep water source. A deep water source typically refers to a water table or a zone of saturated soils. However, these ephemeral desert streams do not generally have water tables within reach of plant roots, and here plants are accessing deep ground water in unsaturated soils (Nilsen et al. 1984).

The dominant species present in this ecological site (Blue paloverde, desert lavender, and Schott's dalea) are near their northern limit of distribution, along the border of the Mojave and Sonoran Deserts. These species are restricted to the warmer Sonoran desert and its biomodal precipitation pattern. Blue paloverde and desert lavender are frost-intolerant and rely on summer precipitation for seed germination. Climate data from the climate stations listed above indicate that temperatures below 28 degrees F may occur between late Dec to mid February, but do not occur every year. In the cooler areas (Hayfield Reservoir) temperatures may fall to the low 20s, about every 3 years. The Eagle Mountain Station indicates closer to a 10 year period between frosts. Both stations indicate a prolonged period of freezing temperatures in January, 1950, with temperatures as low as 14 degrees F at Hayfield Reservoir. The prolonged low temperatures in 1950 would likely have caused some mortality throughout this area. Less severe freezes of shorter durations or less severe temperatures will cause die back of frost-sensitive younger stems and branches, but may not kill the mature or hardened plants. The dynamics of frost is not included in the state and transition model (STM), because the incidence of frost is uncommon, and since this site exists because of the relatively frost free conditions of this area.

Another climatic driver for this ecological site is the reliance of several of these species on summer precipitation. This area receives about 30 percent of its precipitation from July to October from monsoons coming up from Mexico. Summer precipitation is important for the germination and survival of blue paloverde and desert lavender. Winter precipitation is important for seed production, and summer rains with warmer temperatures initiate germination of desert lavender and blue paloverde seeds. Without summer rains and warmer temperatures some of these species would not regenerate well.

Precipitation in this portion of the Sonoran desert is limited, with approximately 2 to 4 inches falling in a given year. The amount of total precipitation, and the timing and frequency of precipitation is highly variable from year to year. In addition, the spatial distribution of precipitation is patchy, as squalls may downpour on one area, but completely miss adjacent mountains or valleys. Hereford et al. (2006) describe shifts from dry to wet periods which may last several decades. During wetter cycles plant species show increases in cover, size, and regeneration; while during drier periods and droughts, regeneration is low and shorter-lived shrubs have high mortality (Hereford et al. 2006, Miriti et al. 2007). Severe droughts have even more pronounced mortality. In the STM below, the drought phase is referring to more severe droughts, which cause high mortality, lack of regeneration and affect plant community composition. Although it is somewhat ambiguous to define, the Reference phase implies that the area is receiving average to above average precipitation, and vegetation is not in decline due to drought.

When precipitation events occur, these ephemeral streams provide important hydrologic functions, such as maintaining water quality by allowing energy dissipation during high water flow. They transport nutrients and sediments, store sediments and nutrients in deposition zones, provide temporary storage of surface water, and longer duration storage of subsurface water. These streams are important ecologically because they provide water and habitat for a variety of plant and animal species. The structure and forage provided by xeroriparian vegetation, and the availability of water (although brief), significantly increases animal abundance along ephemeral streams relative to upland areas. The open channels also provide important migration corridors for wildlife (Levick et al. 2008).

This ecological site is unlikely to burn, due to sparse vegetation within the drainageways and adjacent fans. Non-native grasses are not abundant, and are not likely to develop high fuel loads due to the very rocky surfaces.

When modifications affect the hydrologic function of this ephemeral stream system, this ecological site has the potential to transition to a hydrologically altered state (State 3). Once this threshold is crossed, it is extremely difficult to repair the hydrology of the system. Modifications to hydrology that affect this ecological site are generally surface flow alterations for roads or aqueducts. The diversion of flow can either divert flow away from or to an area. Diversion away from an area will cause a decline in blue paloverde and desert lavender over time, due to the absence of flooding and additional moisture. Addition of flow to an area may cause erosion and channel incision or widening in the flood zone. When the xeroriparian community is lost, important animal species dependent upon this community may be lost from the area as well. Ground water drawdown from household wells (Nishikawa et al. 2004) can deplete the water source for phreatophytes, such as blue paloverde and desert lavender, potentially eliminating these species from certain areas.

State and transition model

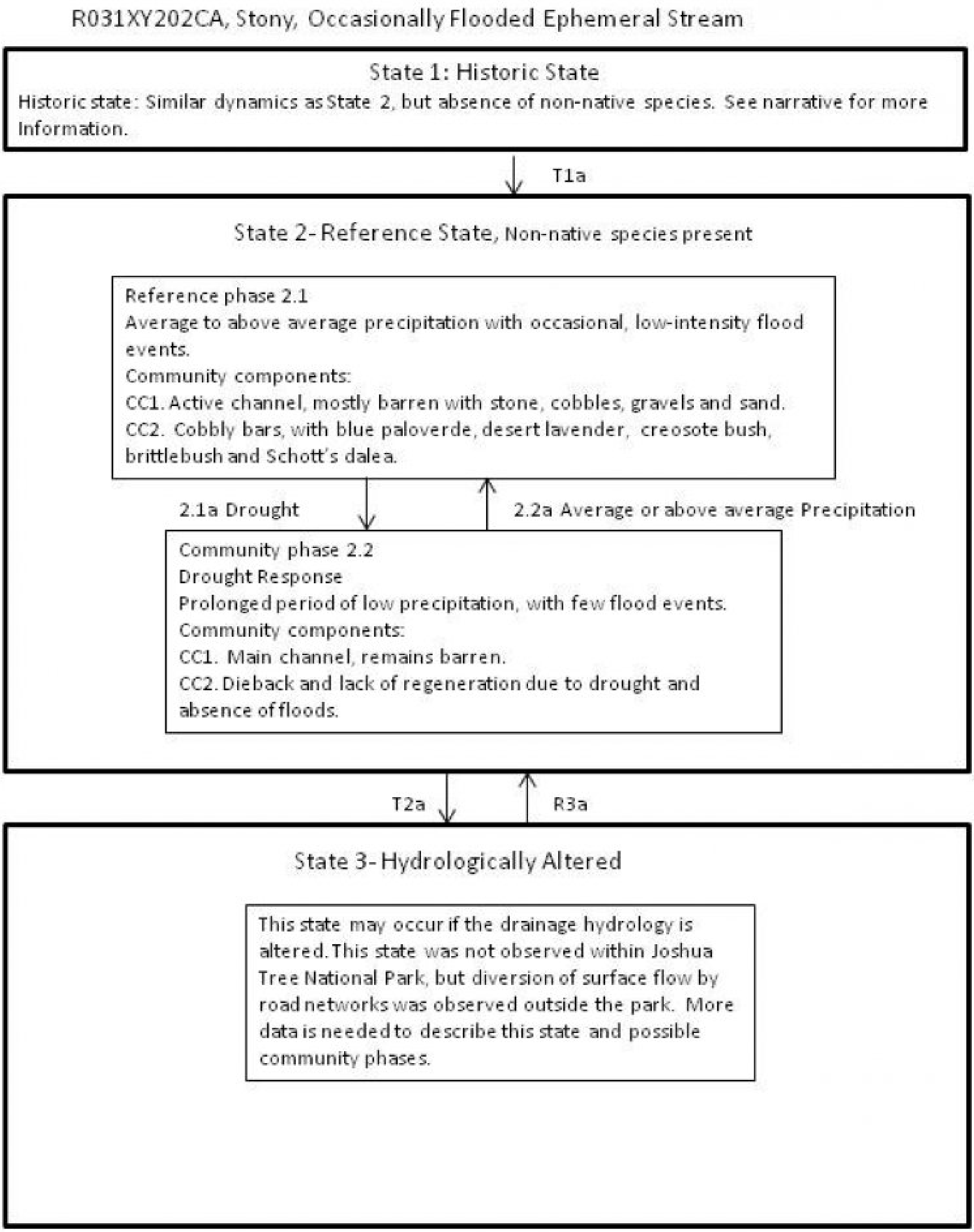

Figure 6. R031XY201CA Model

State 1
Historic

State 1 represents the historic-natural condition for this ecological site. It is similar to State 2, but has only native species. If we were to include dynamics for this state it would be the same as displayed in State 2. The presence of non-native species is minimal in State 2, and has not altered the hydrology or fire frequency.

State 2
Reference State

This state represents the most common and most ecologically intact condition for this ecological site at the present time.

Community 2.1
Reference Phase

Figure 7. Blue paloverde- Schotts dalea

Figure 8. Blue paloverde- Schotts dalea

This community phase is dependent upon unimpaired hydrologic function and average to above average precipitation. These inset fans are relatively confined with limited ability to spread. They are subject to occasional flash-flood events. Community components consist of barren regions where flow concentrates, and one associated plant community. Community Component 1 (CC1) This community is the active barren channels, where flow concentrates. There is very little vegetation, but annuals may be present in some years. Community Component 2 (CC2). This community is present on the undulating stony bars and along the active channel. Blue paloverde has fairly high cover (12 to 16 percent), with desert lavender the next most abundant species. Other shrubs include Schotts dalea and Schott's pygmycedar (*Peucephyllum schottii*). California barrel cactus (*Ferocactus cylindraceus*) is present, as well as the subshrubs brownplume wirelettuce (*Stephanomeria pauciflora*) and Parry's false prairie-clover (*Marina parryi*). Blue paloverde seeds have hard seed coats that need physical scarification before they can imbibe water in order to germinate. During floods the seeds are washed down the channel in a mixture of sand and gravels, which scratch, cut, and grind openings in the hard the seed coat. When the seed coat is cracked, the flood waters soak into the seed, and initiate germination. Blue paloverde is also stem photosynthetic and summer deciduous (Pavek, 1994). Blue paloverde is generally confined to washes, but may exist on more upland sites if soil moisture is sufficient. Desert lavender is found on rocky mountains slopes where additional run-on is available, but is confined to washes in more arid zones of its distribution, which is where this site is located. The production of annual and perennial forbs is dependent upon the annual precipitation, but common species are bristly fiddleneck

(*Amsinckia tessellata*), whitemargin sandmat (*Chamaesyce albomarginata*), cryptantha (Cryptantha sp.), Western Mojave buckwheat (*Eriogonum mohavense*), sowthistle desertdandelion (*Malacothrix sonchoides*), and chia (*Salvia columbariae*). Native grasses present include purple threeawn (*Aristida purpurea*), and sixweeks grama (*Bouteloua barbata*). Non-native species present include red brome (*Bromus rubens*), and Mediterranean grass (Schismus sp.).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	112	168	224
Shrub/Vine	45	67	90
Forb	–	7	11
Grass/Grasslike	–	7	11
Total	**157**	**249**	**336**

Community 2.2 Drought Response

This community develops with prolonged or severe drought. It is difficult to determine the exact duration or intensity of drought that will cause this change, but a one to two year severe drought (of approximately 60 percent or less of average annual precipitation) can cause severe mortality in short lived perennials (Bowers 2005, Hereford et al. 2006, Miriti et al. 2007). During drought years, flood events are unlikely. Shorter lived species (such as brownplume wirelettuce and Parry's false prairie-clover) may suffer high mortality while longer lived species with deeper roots (desert lavender, smoketree, blue paloverde, creosote bush and Schott's dalea) may take longer to respond to drought conditions, but may eventually suffer severe branch die back. With prolonged drought and absence of flooding, regeneration of many of these species will be inhibited, causing a decline in diversity, and favoring the establishment of more upland creosote bush plant communities.

Pathway 2.1a Community 2.1 to 2.2

This pathway is caused by a prolonged or severe drought.

Pathway 2.2a Community 2.2 to 2.1

This pathway occurs with the return of average to above average precipitation and associated flood events.

State 3 Hydrologically Altered

State 3 represents altered hydrological conditions. Data is needed to develop a successional diagram for this state. Altered surface flow was observed due to road crossings. Flow can either be diverted away from or to an area. The diversion of flow from an area will cause a decline of xeroriparian vegetation and subsequent increase of creosote dominated plant communities. Increased flow to an area can cause erosion with channel widening or incision. Ground water drawdown from household wells (Nishikawa et al. 2004) or the diversion of surface flow in the upper watershed can deplete the water source for deep rooted species such as desert lavender, smoketree, blue paloverde, and ironwood.

Community 3.1 Hydrologically Altered

Altered surface flow was observed due to road crossings. Flow can either be diverted away from or to an area. The diversion of flow from an area will cause a decline of xeroriparian vegetation and subsequent increase of creosote dominated plant communities. Increased flow to an area can cause erosion with channel widening or incision. Ground water drawdown from household wells (Nishikawa et al. 2004) or the diversion of surface flow in the upper watershed can deplete the water source for deep rooted species such as desert lavender, smoketree, blue paloverde, and ironwood.

Transition 2A
State 2 to 3

Surface flow alterations, or ground water draw down can trigger a transition to State 3.

Restoration pathway R3a
State 3 to 2

Restoration from State 3 back to State 2 would be an intensive task. Individual site assessments would be required to determine proper restoration methods. Some hydrological modifications are not feasible restored, such as ground water depletion. However, impervious pavement, road diversions, and channel armoring can be redesigned to allow proper infiltration and channel flow. Seeds or plants of appropriate species may need to be reintroduced to the restored channels, and associated sheet-flow areas.

Additional community tables

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
1	**Trees**			112–224	
	blue paloverde	PAFL6	*Parkinsonia florida*	112–224	8–12
Shrub/Vine					
2	**Native shrubs**			45–90	
	desert lavender	HYEM	*Hyptis emoryi*	34–73	1–3
	Schott's dalea	PSSC5	*Psorothamnus schottii*	2–7	5–7
	brownplume wirelettuce	STPA4	*Stephanomeria pauciflora*	1–6	0–1
	California barrel cactus	FECY	*Ferocactus cylindraceus*	1–6	0–1
	Schott's pygmycedar	PESC4	*Peucephyllum schottii*	0–1	0–1
Forb					
3	**Native forbs**			0–11	
	chia	SACO6	*Salvia columbariae*	0–9	0–1
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	0–6	0–1
	Parry's false prairie-clover	MAPA7	*Marina parryi*	0–4	0–1
	sowthistle desertdandelion	MASO	*Malacothrix sonchoides*	0–1	0–1
	whitemargin sandmat	CHAL11	*Chamaesyce albomarginata*	0–1	0–1
	cryptantha	CRYPT	*Cryptantha*	0–1	0–1
	Western Mojave buckwheat	ERMO3	*Eriogonum mohavense*	0–1	0–1
Grass/Grasslike					
4	**Native grasses**			0–11	
	purple threeawn	ARPU9	*Aristida purpurea*	0–9	0–1
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–2	0–1
5	**Non-native annual grasses**			0–1	
	red brome	BRRU2	*Bromus rubens*	0–1	0–1
	Mediterranean grass	SCHIS	*Schismus*	0–1	0–1

Animal community

Small animals live in this ecological site. Animal diversity in this ecological site may be greater than in other areas due to the heterogeneity of the site. Large shrubs and trees, such as blue paloverde provide structural diversity and additional food sources that may support a higher diversity of fauna. Ephemeral drainages are important wildlife migration corridors.

Hydrological functions

Ephemeral drainages provide some similar hydrologic functions as perennial streams. A properly functioning system will maintain water quality by allowing energy dissipation during high water flow. These systems transport nutrients and sediments, and store sediments and nutrients in deposition zones. Ephemeral drainages provide temporary storage of surface water, and longer duration storage of subsurface water (Levick et al. 2008).

Recreational uses

This site provides access for hiking with trees to provide shade. Wildflowers and wildlife may be more abundant in the wash than in the surrounding areas.

Wood products

Blue paloverde wood is used for fire wood, but is not very strong for structural uses(Pavek 1994).

Other products

Blue paloverde seeds are edible after being prepared and cooked properly (Pavek 1994, Phillips and Wentworth 2000). Desert lavender is used in landscaping, because it has a pleasant aroma and it attracts bees and hummingbirds.

Inventory data references

The following NRCS vegetation plot was used to describe this ecological site:

1247710307

Type locality

Location 1: Riverside County, CA	
UTM zone	N
UTM northing	3726443
UTM easting	601553
General legal description	The type location is about 5 miles east of the Cactus City Rest Area on HW 10. It is about .25 miles north of HW 10 on BLM property.

Other references

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Contributors

Marchel Munnecke

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:**

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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:**