

Ecological site R030XY001CA

Occasionally Flooded, Hyperthermic, Diffuse Ephemeral Stream

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General information

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

MLRA notes

Major Land Resource Area (MLRA): 030X–Mojave Basin and Range

MLRA statement: 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 notes

"XY" LRU: This LRU is found throughout the Mojave Desert MLRA. This LRU designation is set aside for ecological sites that are ubiquitous throughout the MLRA. These sites are driven by environmental or chemical features that override the climatic designations of the other LRU's or are atypical compared to the surrounding landscape. Common overriding XY characteristics within this MLRA include: ephemeral streams subject to flash flood events, riparian areas or other water features, and soils with strong chemical influence (Na, Ca, etc).

Ecological site concept

This ecological site is associated with first and second order drainageways, where flow loses velocity or becomes divergent across inset fans and fan aprons. This site has small active drainageways, with adjacent areas that are prone low intensity sheet floods of less frequency. Creosote bush (*Larrea tridentata*), Schott's dalea (*Psoralea schottii*) and burrobush (*Ambrosia dumosa*) are dominant on this site. It is found at elevations of 1020 to 3280 feet and on 0 to 8 percent slopes. 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. This site is part of provisional concept R030XY001CA

Associated sites

R030XY038CA	Flooded Gravelly Fans This ecological site is on gravelly alluvial fans that experience sheet floods, and a high diversity of species are present including Schott's dalea, creosote bush, desertsenna, Mexican bladdersage and Mojave Yucca.
R030XD025CA	Hyperthermic Sandsheets This ecological site is on adjacent sandsheets with creosote bush, burrobush, and dyebush.
R030XD042CA	Hyperthermic Shallow To Moderately Deep Fan Remnants This ecological site is on fan remnants with sparse cover of creosote bush.

R030XD006CA	Abandoned Fan This ecological site is on adjacent fan remnants with very sparse creosote bush.
R030XD014CA	Hyperthermic Sandy Plains This ecological site is on sand sheets with big galleta and creosote bush.
R030XD015CA	Hyper-Arid Fans This ecological site is on adjacent alluvial fans with creosote bush and burrobrush.

Similar sites

R030XY128CA	Broad, Gravelly, Hyperthermic Ephemeral Stream This ecological site is on similar soils, but is in very large drainageways with burrobrush and desert lavender.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Larrea tridentata</i> (2) <i>Psoralea schottii</i>
Herbaceous	(1) <i>Chamaesyce albomarginata</i>

Physiographic features

This site is found on occasionally flooded drainageways, inset fan, and fan aprons. Elevations range from 1020 to 3280 feet, and slopes range from 0 to 8 percent.

Table 2. Representative physiographic features

Landforms	(1) Drainageway (2) Inset fan (3) Fan apron
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	None to occasional
Elevation	310 – 1,000 m
Slope	0 – 10 %

Climatic features

The climate is arid with hot, dry summers and warm, moist winters. The mean annual precipitation is 75 to 125 millimeters (3 to 5 inches) and the mean annual air temperature is 20 to 23 degrees C (68 to 73 degrees F.). The frost-free season is 300 to 340 days, and the freeze-free season is 340 to 360 days.

The tabular climate summary for this ESD was generated by the Climate Summarizer (http://www.nm.nrcs.usda.gov/technical/handbooks/nrph/Climate_Summarizer.xls) using data from the climate stations listed below (results are unweighted averages).

Table 3 Representative climatic features

Frost-free period (average)	340 days
Freeze-free period (average)	360 days
Precipitation total (average)	130 mm

Influencing water features

This ecological site is influenced by occasional flash flood events, which flood the drainageways and sheet flood across inset fans and alluvial fans.

Soil features

The soils associated with this ecological site are very deep, somewhat excessively to excessively drained, and formed in alluvium from gneiss or granitoid parent material. The surface textures are very gravelly loamy sand and gravelly sand. Subsurface horizons (1 to 59 inches) are composed of sandy textures with non gravelly to extremely gravelly modifiers. The surface rock fragments less than 3 inches range from 0 to 45 percent cover, and fragments greater than 3 inches range from 0 to 35 percent cover. The subsurface percent by volume of rock fragments less than 3 inches ranges from 17 to 65, and greater than 3 inch fragments range from 0 to 5.

The Carrizo soils are: sandy-skeletal, mixed, hyperthermic Typic Torriorthents. The Pintobasin soils are: mixed, hyperthermic Typic Torripsamments.

This ecological site is associated with the following map units and soil components within the Joshua Tree National Park Soil Survey (CA794):

Mapunit ID; Mapunit name; Component; phase; percent

1511; Carrizo complex, 2 to 8 percent slopes, flooded; Carrizo; occasionally flooded; 15
1512; Carrizo extremely gravelly loamy sand, 2 to 8 percent slopes; Carrizo; occasionally flooded; 2
1515; Pintobasin-Carrizo complex, 2 to 8 percent slopes; Carrizo; occasionally flooded; 15
1522; Pintobasin sand, 1 to 3 percent slopes, rarely flooded; Pintobasin; occasionally flooded; 3
1523; Pintobasin-Aquapeak association, 2 to 4 percent slopes; Pintobasin; occasionally flooded; 20
1525; Pintobasin complex, 2 to 4 percent slopes, flooded; Pintobasin; occasionally flooded; 45
1530; Dalelake fine sand, 0 to 4 percent slopes; Pintobasin; occasionally flooded; 5
2060; Joetree-Dalelake-Pintobasin complex, 0 to 2 percent slopes; Pintobasin; occasionally flooded; 5

Table 4. Representative soil features

Parent material	(1) Alluvium – granite
Surface texture	(1) Very gravelly loamy sand (2) Gravelly sand

Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained to excessively drained
Permeability class	Rapid
Soil depth	150 cm
Surface fragment cover <=3"	0 – 50 %
Surface fragment cover >3"	0 – 40 %
Available water capacity (0-101.6cm)	2.54 – 7.11 cm
Calcium carbonate equivalent (0-101.6cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	10
Subsurface fragment volume <=3" (Depth not specified)	20 – 70 %
Subsurface fragment volume >3" (Depth not specified)	0 – 10 %

Ecological dynamics

This ecological site occurs at the base of mountains on drainageways, inset fans and fan aprons. This site is distinguished by a small drainage size, on first and second order streams, low sediment transport capacity, and the absence of deep rooted phreatophytes, such as desert willow or catclaw acacia. This site receives flow from first and second order drainageways, but the flow infiltrates into the sandy

soils in the divergent channels, leaving the distal areas without surface flow except in extreme precipitation events. Soil disturbance from flash flood events is the primary driver of plant community dynamics within this ecological site. The soils are hyperthermic, very deep, and composed of sands and gravels. Shrub diversity is higher than the surrounding less flooded landforms on the fan piedmont slope. Schott's dahlia, creosote bush and burrobush dominate the site.

Ephemeral streams lack permanent flow except in response to rainfall events (Bull 1997, Levick et al. 2008). These ephemeral streams are characterized by extreme and rapid variations in flooding regime, and a high degree of temporal and spatial variability in hydrologic processes (Bull 1997, Stanley et al. 1997, Levick et al. 2008, Shaw and Cooper 2008). 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. Deep rooted phreatophytes, that rely primarily rely on a deep water source such as desert willow, smoketree, and catclaw acacia are generally absent. Collectively, the plant communities along the drainageways are considered xeroriparian vegetation, and provide xeroriparian habitat.

This site can experience channel avulsion (defined as the "diversion of the majority of the surface flow to a different channel, with total or partial abandonment of the original channel" [(Field 2001)]). As sediment deposits in the active drainageway the likelihood of channel avulsion increases because of decreased drainageway volume. Cycles of channel avulsion on alluvial fans are an ongoing and a long-term process in the development of alluvial fans, and can occur after any substantial overland flow event when existing channel capacity is rapidly and dramatically exceeded.

The active channels are small, and are composed of bare sand and gravels. In less active areas creosote bush, Schott's dalea, and burrobush are present. Creosote bush and burrobush are larger and more productive in the wash than in neighboring alluvial fans, without the extra run-on. Creosote bush and burrobush are community dominants on adjacent fan aprons. Schott's dalea depends on flood water for dispersal and seed germination (Vogl and McHargue 1966), and occurs on hyperthermic soils in habitats receiving additional run-on such as rocky hill-slopes, washes, and alluvial fans with regular sheet-flow. This site is at the northern most distribution of Schott's dalea. It is more common further south in California and Northern Mexico. Data is lacking on the ecology of this species.

Other disturbances such as drought, fire, and human hydrologic alterations can affect the community composition and/or hydrologic process of this site. Drought is common in the desert, and can cause mortality or die-back of vegetation. Decreased vegetative cover can lead to increased erosion and change sediment deposition patterns, possibly increasing the chance of channel migration.

Historically fire was very uncommon in these ephemeral drainages; however the presence of continuous and flashy fuels from non-native grasses in adjacent upland sites can increase the possibility of fire. Invasion by non-native annual grasses has increased the flammability of desert vegetation communities (Brooks 1999 2004), and after fire, Mojave Desert ecosystems appear to be more susceptible to invasion by exotic grasses, leading to a grass-fire cycle (D'Antonio and Vitousek 1992). Very wet (El Nino) years followed by severe drought produce conditions where large areas where creosote scrub burn (Brown and Minnich 1986, DeFalco et al. 2010).

A properly functioning ephemeral drainage will provide some similar hydrologic functions as perennial streams. Ephemeral streams maintain 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. The structure and forage provided by diverse vegetation, and the availability of water (although brief), significantly increases animal abundance along ephemeral streams relative to upland areas. The open channels provide important migration corridors for wildlife (Levick et al. 2008).

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 hydrologic system.

Modifications to hydrology such as surface flow alterations, ground water depletion, and loss of vegetative cover can have irreversible impacts on hydrologic processes (Nishikawa et al. 2004, Levick et al. 2008). An increase in cover of impermeable surfaces (such as pavement, homes, malls, etc.) reduces the amount of runoff that can infiltrate into the soil creating higher surface runoff and greater peak flows. The runoff is collected in ditches, culverts, and drainage networks, and diverted to the nearest ephemeral stream. In some areas, ephemeral streams are armored to reduce damage to property from flood events. These confined channels reduce the ability for the stream to spread out and decrease flow velocity to allow sediment deposition. As a result, the channels will generally incise, with a higher volume of concentrated flows. These processes eventually cause higher peak flows due to increased runoff and concentrated flows. Higher flow velocities may cause uprooting, stem breakage or scour under the roots of vegetation. This loss of root structure along the stream increases scour potential, and the loss of above ground vegetation will increase flow velocity. When the vegetative community is degraded, 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 deep rooted species.

State and transition model

Figure 3. R030XY001CA

Additional community tables

Table 5. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Shrub/Vine					
1	Native shrubs			45-392	
	creosote bush	LATR2	<i>Larrea tridentata</i>	17-314	2-5
	burrobush	AMDU2	<i>Ambrosia dumosa</i>	6-47	1-3
	Schott's dalea	PSSC5	<i>Psoralea schottii</i>	6-16	1-4
	burrobrush	HYSA	<i>Hymenoclea salsola</i>	0-6	0-1
	bladderpod spiderflower	CLIS	<i>Cleome isomeris</i>	0-6	0-1
	brittlebush	ENFA	<i>Encelia farinosa</i>	1-4	0-1
	brownplume wirelettuce	STPA4	<i>Stephanomeria pauciflora</i>	1-4	0-1
	Wiggins' cholla	CYEC3	<i>Cylindropuntia echinocarpa</i>	0-1	0-1
	branched pencil cholla	CYRA9	<i>Cylindropuntia ramosissima</i>	0-1	0-1
Forb					
2	Native forbs			0-45	
	whitemargin sandmat	CHAL11	<i>Chamaesyce albomarginata</i>	0-38	0-1
	cryptantha	CRYPT	<i>Cryptantha</i>	0-6	0-1
	smooth desertdandelion	MAGL3	<i>Malacothrix glabrata</i>	0-4	0-1
	birdcage evening primrose	OEDE2	<i>Oenothera deltoides</i>	0-1	0-1
	desert Indianwheat	PLOV	<i>Plantago ovata</i>	0-1	0-1
	chia	SACO6	<i>Salvia columbariae</i>	0-1	0-1
	Western Mojave buckwheat	ERMO3	<i>Eriogonum mohavense</i>	0-1	0-1
3	Non-native annual forbs			0-3	
	redstem stork's bill	ERCI6	<i>Erodium cicutarium</i>	0-3	0-1
Grass/Grasslike					
4	Non-native annual grasses			0-3	
	red brome	BRRU2	<i>Bromus rubens</i>	0-3	0-1
	Mediterranean grass	SCHIS	<i>Schismus</i>	0-1	0-1

Table 6. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 3.1 plant community composition

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

This site provides shade, food plants, and cover for a variety of animals. The site has complex vertical structure which provides habitat for birds to perch. Creosote bush is a dominant plant in the site whose root-mound provides good burrowing for lizards, ground squirrels, and other small rodents. Cover is necessary for a wide variety of animals as a refuge from predators. The number of large shrubs and high plant cover allow for many suitable hiding places. Some of the animals that use cover as protection include rodents, birds, snakes and lizards. This site provides habitat for the Threatened desert tortoise.

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 many opportunities to view wildlife and wildflowers, with open corridors for easier access.

Other information

Creosote bush is an important medicinal plant for Native Americans. It has a very wide range of uses from treatment for consumption, bowl complaints, and menstrual cramps, to induce vomiting, relief for arthritis, rheumatism, aching bones and sprains, congestion and cold, as an antiseptic and disinfectant, dandruff, antispasmodic, to induce urination, gonorrhea, and to cancer treatment. (This list is not exhaustive). <http://herb.umd.umich.edu/herb/search.pl?searchstring=Larrea+tridentata>. Creosote bush stems are used to make weapons, digging tools, and basket handles, and creosote gum is used for knife and awl handles. Creosote bush branches are used as thatch in dwelling construction. <http://herb.umd.umich.edu/herb/search.pl?searchstring=Larrea+tridentata>.

Inventory data references

The followin NRCS plots were used to describe this ecological site: X-9 (Patty Novack) Type location 72210-01 PF304-Check

Type locality

Location 1: San Bernardino County, CA	
UTM zone	N
UTM northing	3755312
UTM easting	609024
General legal description	The type location is in Joshua Tree National Park, in Pintobasin, at the base of Pinto Mountain, about 2.5 miles southwest of the peak.

Other references

Bowers, J. E. 2005. Effects of drought on shrub survival and longevity in the northern Sonoran Desert. *Journal of the Torrey Botanical Society* 132:421-431.

Brooks, M. L. 1999. Habitat invasibility and dominance by alien annual plants in the western Mojave Desert. *Biological Invasions* 1:325-337.

Brooks, M. L., T. C. Esque, and T. Duck. 2007. Creosotebush, blackbrush, and interior chaparral shrublands. RMRS-GTR-202.

Brown, D. E. and R. A. Minnich. 1986. Fire and Changes in Creosote Bush Scrub of the Western Sonoran Desert, California. *American Midland Naturalist* 116:411-422.

Bull, W. B. 1997. Discontinuous ephemeral streams. *Geomorphology* 19:227-276.

D'Antonio, C. M. and P. M. Vitousek. 1992. Biological invasions by exotic grasses, the grass/fire cycle, and global change. *Annual Review of Ecology and Systematics* 23:63-87.

DeFalco, L. A., T. C. Esque, S. J. Scoles-Sciulla, and J. Rodgers. 2010. Desert wildfire and severe drought diminish survivorship of the long-lived Joshua tree (*Yucca brevifolia*; Agavaceae). *American Journal of Botany* 97:243-250.

Field, J. 2001. Channel avulsion on alluvial fans in southern Arizona. *Geomorphology* 37:93-104.

Hereford, R., R. H. Webb, and C. I. Longpre. 2006. Precipitation history and ecosystem response to multidecadal precipitation variability in the Mojave Desert region, 1893-2001. *Journal of Arid Environments* 67:13-34.

Levick, L., J. .Fonseca, D. Goodrich, M. Hernandez, D. Semmens, J. Stromberg, R. Leidy, M. Scianni, D. P. Guertin, M. Tluczek, and W. Kepner. 2008. The ecological and hydrological significance of ephemeral and intermittent streams in the arid and semi-arid American Southwest.

Miriti, M. N., S. Rodriguez-Buritica, S. J. Wright, and H. F. Howe. 2007. Episodic death across species of desert shrubs. *Ecology* 88:32-36.

Nishikawa, T., J. A. Izbicki, C. L. Stamos, and P. Martin. 2004. Evaluation of geohydrologic framework, recharge estimates, and ground-water flow of the Joshua Tree area, San Bernardino County, California., U.S. Geological Survey.

Shaw, J. R. and D. J. Cooper. 2008. Linkages among watersheds, stream reaches, and riparian vegetation in dryland ephemeral stream networks. *Journal of Hydrology* 350:

Stanley, E. H., S. G. Fisher, and N. B. Grimm. 1997. Ecosystem expansion and contraction in streams. *Bioscience* 47:427-439.

Steers, R. J. and E. B. Allen. 2011. Fire effects on perennial vegetation in the western Colorado Desert, USA. *Fire Ecology* 7:59-74.

Vogl, R. J. and L. T. McHargue. 1966. Vegetation of California palm oases on the San Andreas Fault. *Ecology* 47:532-540.

Contributors

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Approval

Kendra Moseley, 10/21/2024

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	09/04/2026
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills:

2. Presence of water flow patterns:

3. Number and height of erosional pedestals or terracettes:

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:
