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Ecological site R030XB187CA
Rarely Flooded Warm Thermic Ephemeral System

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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.

Ecological site concept

Ecological Site Concept: This ecological site occurs on rarely flooded drainageways. These are first order drainageways with a zone of active scouring. These small drainages generally develop from surface flow across alluvial fans, but may also receive additional run-off from small mountain drainageways. This ecological site is associated with very deep, somewhat excessively drained soils that have sand or loamy sand textures throughout. This site is associated with a rare flooding regime, where flash flooding may occur 1 to 5 times in 100 years. However, even minimal precipitation will drain to this site, providing higher water availability in the drainageway than the surrounding fans. This site supports a productive and diverse shrub community composed of a mix of long and short-lived species. Creosote bush (Larrea tridentata) and burrobrush (Hymenoclea salsola) dominate. Elevations range from 2,140 to 4,170 feet, with 2 to 4 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 is a group concept and provisional STM that also covers the following ecological sites: R030XB136CA, R030XY159CA R030XY223CA R030XB011CA R030XY136CA

Associated sites

R030XB192CA	**Very Rarely Flooded, Warm Thermic Fan Piedmonts** This ecological site is not situated in a drainageway, and is dominated by creosote bush and desert senna.
R030XB005NV	**Arid Active Alluvial Fans** This ecological site is on alluvial fans adjacent to this site at the lower elevations. Creosote bush and burrobush dominate.
R030XB174CA	**Sandy Fan Aprons** This ecological site is on adjacent alluvial fans, with deep to very deep soils with creosote bush and Joshua Tree.

R030XB183CA	**Loamy Very Deep Fan Remnants** This ecological site is on alluvial fans at the upper elevations of this site with blackbrush and creosote bush.
R030XB191CA	**Sandy Pediment** This ecological site is on pediments with shallow to very shallow soils, with big galleta, creosote bush and blackbrush.

Similar sites

R030XY202CA	**Very Rarely To Rarely Flooded Thermic Ephemeral Stream** This very rarely flooded ephemeral stream is at the upper headwaters, with limited catchment size, Nevada jointfir is common.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Larrea tridentata* (2) *Hymenoclea salsola*
Herbaceous	Not specified

Physiographic features

This ecological site occurs in drainageways on fan piedmonts. It occurs at elevations of 2,120 to 4,170 feet and slopes range from 2 to 4 percent.

Table 2. Representative physiographic features

Landforms	(1) Drainageway
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	650 – 1,270 m
Slope	0 %
Aspect	Aspect is not a significant factor

Climatic features

The climate is arid with hot, dry summers and warm, moist winters. The mean annual precipitation is 76 to 178 millimeters (3 to 7 inches); mean annual air temperature is 12.7 to 20 degrees C. (55 to 68 degrees F.), and the frost-free season is 210 to 320 days.

Freeze free period was not entered, thus defaults to 0.

The Joshua Tree weather station is nearby this ecological site and within the elevation range of this ecological site, but is lacking precipitation data for the years between 1975 and 2008.

Table 3 Representative climatic features

Frost-free period (average)	320 days
Freeze-free period (average)	
Precipitation total (average)	1,730 mm

Influencing water features

This ecological site exists in small drainageways which are influenced by rare flash flood events.

Soil features

This ecological site is associated with the Morongo soil series, and only exists as a 5 percent or less component within a mapunit. The Morongo soils are alluvial soils derived from granitoid and/or gneissic rocks. These soils are very deep with sand and loamy sand surface textures, and sand, loamy sand, and gravelly loamy sand subsurface textures (for a depth of 0.8 to 60 inches). For rock fragments less than 3 inches in diameter, the percent surface cover ranges from 40 to 85 percent, and subsurface volume ranges from 5 to 15 percent (for a depth of 0.8 to 60 inches). For rock fragments greater than 3 inches in diameter, the percent surface cover ranges from 0 to 5 percent, and are absent in subsurface horizons. This soil is somewhat excessively drained with moderate to rapid permeability. The Morongo soils are classified as mixed, thermic Typic Torripsamments.

This ecological site has been correlated to the following map units and soil components in the Joshua Tree National Park Soil Survey (CA794):

Map unit, percent, component and phase
3677, 2 Morongo rarely flooded
3683, 3 Morongo rarely flooded
3684, 5 Morongo rarely flooded
4245, 3 Morongo rarely flooded

Table 4. Representative soil features

Parent material	(1) Alluvium – granite
Surface texture	(1) Sand (2) Loamy sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained

Permeability class	Moderate to rapid
Soil depth	150 cm
Surface fragment cover <=3"	40 – 90 %
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-101.6cm)	4.06 – 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)	7.6 – 8.2
Subsurface fragment volume <=3" (Depth not specified)	10 – 20 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

This ecological site describes the dynamics of first and second order ephemeral stream systems. This ecological site occurs on broad low relief drainageways, which experience rare, low energy flood events. This site has thermic soil temperatures, with 3 to 7 inches mean annual precipitation (MAP). Elevations range from 2,120 to 4,170 feet. The distinguishing features are the small drainage size (generally less than 800 acres based on preliminary GIS analysis of catchment size) and a rare flooding regime with creosote bush and burrobrush dominant.

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). 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).

This broad low energy wash typically occurs as side channel to a larger ephemeral stream, primarily the Large Thermic Ephemeral Stream System, R030XY167CA. R030XY167CA occurs in large drainageways, and desert willow is a distinguishing species. In some instances, this ecological site does not connect with a larger drainage system, and surface flow eventually infiltrates into the substratum, where the active channel is replaced with upland vegetation.

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 dominant plants in this ecological site are creosote bush and burrobrush, with peach thorn (Lycium cooperi), desertsenna (Senna armata), and jojoba (Simmondsia chinensis) common secondary species. Creosote bush is present along the channel margins of this site or on raised bars within the active flooding zone. Individuals are larger and more productive in the wash than in neighboring alluvial fans, without the extra run-on. Burrobrush is a pioneer species that can quickly colonize disturbed areas, and may establish in ephemeral washes and upland sites (Sawyer et al. 2009). In this ecological site, it is dominant in channels where flooding frequency is highest. This drought-tolerant vegetation that exists along the ephemeral streams 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 the increased availability of water and flood disturbances in these drainageways. Phreatophytes, deep rooted species that primarily rely on a deep water source, such as catclaw acacia (Acacia greggii) and desert willow (Chilopsis linearis), are generally absent from this ecological site. Catclaw acacia and desert willow also require more frequent flooding for seedling establishment.

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, Brooks et al. 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).

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 the xeroriparian vegetation 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, retaining walls are built along ephemeral streams 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.

State and transition model

Figure 3. R030XY187CA

Additional community tables

Table 5. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Shrub/Vine					
1	**Shrubs**			213-252	
	creosote bush	LATR2	*Larrea tridentata*	84-129	1-4
	burrobrush	HYSA	*Hymenoclea salsola*	11-45	2-6
	desertsenna	SEAR8	*Senna armata*	20-45	1-3
	white ratany	KRGR	*Krameria grayi*	0-45	0-2
	peach thorn	LYCO2	*Lycium cooperi*	0-39	0-4
	Mojave indigobush	PSAR4	*Psorothamnus arborescens*	0-17	0-2

	jojoba	SICH	*Simmondsia chinensis*	0-17	0-1
	water jacket	LYAN	*Lycium andersonii*	0-11	0-1
	bladderpod spiderflower	CLIS	*Cleome isomeris*	0-11	0-1
	Wiggins' cholla	CYEC3	*Cylindropuntia echinocarpa*	0-11	0-1
	Mojave yucca	YUSC2	*Yucca schidigera*	0-6	0-1
	branched pencil cholla	CYRA9	*Cylindropuntia ramosissima*	0-4	0-1
Forb					
2	**Forbs**			31-112	
	Esteve's pincushion	CHST	*Chaenactis stevioides*	11-90	1-3
	Thurber's sandpaper plant	PETH4	*Petalonyx thurberi*	0-29	0-1
	red brome	BRRU2	*Bromus rubens*	6-28	–
	cryptantha	CRYPT	*Cryptantha*	0-11	0-3
	pincushion flower	CHFR	*Chaenactis fremontii*	0-11	0-3
	smooth desertdandelion	MAGL3	*Malacothrix glabrata*	0-11	0-1
	curvenut combseed	PERE	*Pectocarya recurvata*	0-6	0-2
	Mojave desertstar	MOBE2	*Monoptilon bellioides*	0-1	0-1
	purplemat	NADE	*Nama demissum*	0-1	0-1
	Great Basin langloisia	LASES	*Langloisia setosissima ssp. setosissima*	0-1	0-1
	Bigelow's tickseed	COBI	*Coreopsis bigelovii*	0-1	0-1
	woolly easterbonnets	ANWA	*Antheropeas wallacei*	0-1	0-1
	suncup	CAMIS	*Camissonia*	0-1	0-1
	western tansymustard	DEPI	*Descurainia pinnata*	0-1	0
4	**Non-native forbs**			0-1	
	redstem stork's bill	ERCI6	*Erodium cicutarium*	0-1	0-1
Grass/Grasslike					
3	**non-native grass**			0-1	
	Mediterranean grass	SCHIS	*Schismus*	0-1	0-2

Table 6. Community 2.2 plant community composition

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

Table 7. Community 2.3 plant community composition

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

Table 8. Community 3.1 plant community composition

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

Animal community

The desert tortoise (Gopherus agassizii agassizii), Southern Desert Cottontail (Sylvilagus audubonii arizonae), Desert Coyote (Canis latrans mearnsi), Desert Kit Fox desert (Vulpes macrotis arsipus), and several species of snakes, lizards, rodents, utilize this ecological site. Large shrubs create structural diversity that may help support a higher diversity of fauna, and ephemeral drainages provide 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

These drainageways provide open travel corridors for hiking trails and wildlife viewing.

Other products

Creosote bush is an important medicinal plant for indigenous people. The leaves and twigs are used in several methods to create medicine. An insect, (Tachardiella larreae) produces lac deposits that hardens like plastic and is used a commercial sealing wax and by indigenous people to seal lids. Creosote bush resin is used as a wood preservative (Marshall 1995). The leaves and twigs of burrobrush are also used for medicinal purposes (Tesky, 1993).

Inventory data references

The following NRCS vegetation plots were used to describe this ecological site: State 2 CC2 1249706111, Morongo 1249706106, Morongo (type location)

Type locality

Location 1: San Bernardino County, CA	
UTM zone	N
UTM northing	3769480
UTM easting	590274
General legal description	The type location is approximately 3 miles in from the North entrance station and .2 miles east of Park Blvd., in Joshua Tree National Park.

Other references

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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	09/02/2026
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:

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

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

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

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**
