USDA Natural Resources
Conservation Service

Ecological site R030XB011CA
Braided Hyperthmic Ephemeral Drainage Complex

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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

This LRU (designated by 'XD') is found on the eastern side of California and much of the low-elevations of Nevada and northwestern Arizona. Elevations range from 400 to 2200 feet on average, but may be found up to 3600 feet on southern exposures. Precipitation ranges from 1 to 6 inches per year, but averages between 2-4 inches. This LRU is characterized primarily by the extreme aridity, hot air temperatures, hyperthermic soil temperatures, and low vigor/low stature of widely spaced vegetation. Temperatures can reach over 110 degrees Fahrenheit for several weeks in July and August. Summer precipitation falls between July and September, ranging from 20-33% in the form of rain, and winter precipitation falls starting in November and ends between February and March, ranging from 56-70%, also mostly in the form of rain. Vegetation is primarily small, widely-spaced, low-producing creosote bush (*Larrea tridentata*), burrobush (*Ambrosia dumosa*), and brittlebush (Encelia farinosa).

Ecological site concept

This ecological site occurs on inset fans and channel margins of braided, small (1st or 2nd order) ephemeral drainageways on hyperthermic fan aprons. Drainageways intermittently flood during high precipitation events, but since they occur on fan aprons away from the base of mountains, flow is relatively diffuse. Soils are very deep and gravelly.

Intermittent flooding provides soil disturbance and additional moisture that supports a more productive and diverse plant community than surrounding upland fan aprons, but hyperthermic temperatures, low precipitation, and relatively diffuse flow keep the plant community relatively simple and of lower production than larger drainage systems, or drainage systems receiving greater precipitation. White burrobush (*Hymenoclea salsola*) is a dominant plant, and burrobush (*Ambrosia dumosa*) and creosote bush (*Larrea tridentata*) are important secondary species. Desert senna (*Senna armata*) is often present.

This site is part of group concept R030XB187CA.

Associated sites

R030XD014CA	**Hyperthermic Sandy Plains** This ecological site occurs on adjacent sand sheets.
R030XD015CA	**Hyper-Arid Fans** This ecological site occurs on adjacent upland fan aprons with very rare to rare flooding.

Similar sites

R030XY136CA	**Dry Wash** This ecological site occurs on larger drainageways (order 2 to 3), and occurs in valleys draining mountains, or close to the base of mountains. Flow is more concentrated, and channels are deeper and more complex. Species composition is similar, but a greater diversity of species and plant communities is present.
R030XD015CA	**Hyper-Arid Fans** This ecological site occurs on fan aprons with very rare to rare sheet flooding. It is not associated with drainageways. Creosote bush and burrobush are the dominant species. If white burrobush or desert senna are present, they are confined to a patch of localized disturbance.
R030XY223CA	**Dry Wash** This ecological site occurs on similar diffuse, braided channels on fan aprons, but it occurs on lower fan positions at lower elevations. More arid conditions, finer soil textures, and greater salinity increase habitat suitability for cattle saltbush (Atriplex polycarpa) which is a dominant species on this site. White burrobush is trace if present.

Table 1. Dominant plant species

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

Physiographic features

This ecological site occurs on channel margins and inset fans of small (1st or 2nd order) ephemeral drainageways. Elevations range from 300 to 900 feet, and slopes range from 1 to 8 percent, but slopes below 5 percent are typical. This site occasionally flooded, and runoff class is very low.

Table 2. Representative physiographic features

Landforms	(1) Drainageway (2) Inset fan
Flooding frequency	Occasional
Elevation	300–900 ft
Slope	1–8%
Aspect	Aspect is not a significant factor

Climatic features

Influencing water features

Soil features

The dominant soils associated with this ecological site are very deep, somewhat excessively drained soils that formed in alluvium from mixed parent material. These soils are sandy in the particle size control section, and

permeability is rapid. Surface textures are gravelly sand and fine sand, and subsurface horizons (1 to 59 inches) are composed of stratified layers of very gravelly to gravelly sand and coarse sand. Surface gravels (< 3 mm in diameter) range from 25 to 49 percent, and larger rock fragments (> 3 mm in diameter) range from 4 to 6 percent. Subsurface gravels by volume (for a depth of 0 to 59 inches) range from 28 to 80 percent, and larger fragments range from 10 to 50 percent.

This ecological site is associated with the Carrwash soils (Sandy-skeletal, mixed, hyperthermic Typic Torriorthents); and the Carrizo soils (Sandy-skeletal, mixed, hyperthermic Typic Torriorthents).

Table 3. Representative soil features

Surface texture	(1) Gravelly sand (2) Fine sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained
Soil depth	60 in
Surface fragment cover <=3"	25–49%
Surface fragment cover >3"	4–6%
Subsurface fragment volume <=3" (Depth not specified)	28–80%
Subsurface fragment volume >3" (Depth not specified)	10–50%

Ecological dynamics

These small, braided ephemeral streams are on inset fans and drainageways on mid-fan positions on fan aprons. Mid fan positions mean that high volume concentrated flow off of mountains does not occur, and channels are shallow with relatively diffuse flow. Soils are very deep gravelly sands.

Intermittent flooding provides soil disturbance and additional moisture that supports a more productive and diverse plant community than surrounding upland fan aprons, but hyperthermic temperatures, low precipitation, and relatively diffuse flow keeps the plant community relatively simple and of lower production than larger drainage systems, or drainage systems receiving greater precipitation. White burrobush (*Hymenoclea salsola*) is a dominant shrub, and burrobush (*Ambrosia dumosa*) and creosote bush (*Larrea tridentata*) are important secondary species. Desertsenna (*Senna armata*) is often present.

This ecological site is very unlikely to burn, or to burn extensively due to extremely low production of surrounding hyperthermic fan aprons.

Road development and associated ditches alter drainage patterns, which may cause drainageways to become wider, deeper, and alter their course, or may divert flow away from channels which would transition them to an upland community. If the site experiences significant surface disturbance, the abundance of white burrobush (*Hymenoclea salsola*) would increase. Initially after the disturbance, the site would experience heavier sediment loads down the active channel, becoming more deeply incised. Later on as white burrobush invaded those disturbed areas, the surface layers would stabilize. If the hydrology were to change, routing water away from the wash, the site would loose its wash-dependant species like white burrobush and desertsenna. The site would then be colonized by the plants characteristic of the surrounding alluvial fans and fan remnants, burrobush and creosote bush.

State and transition model

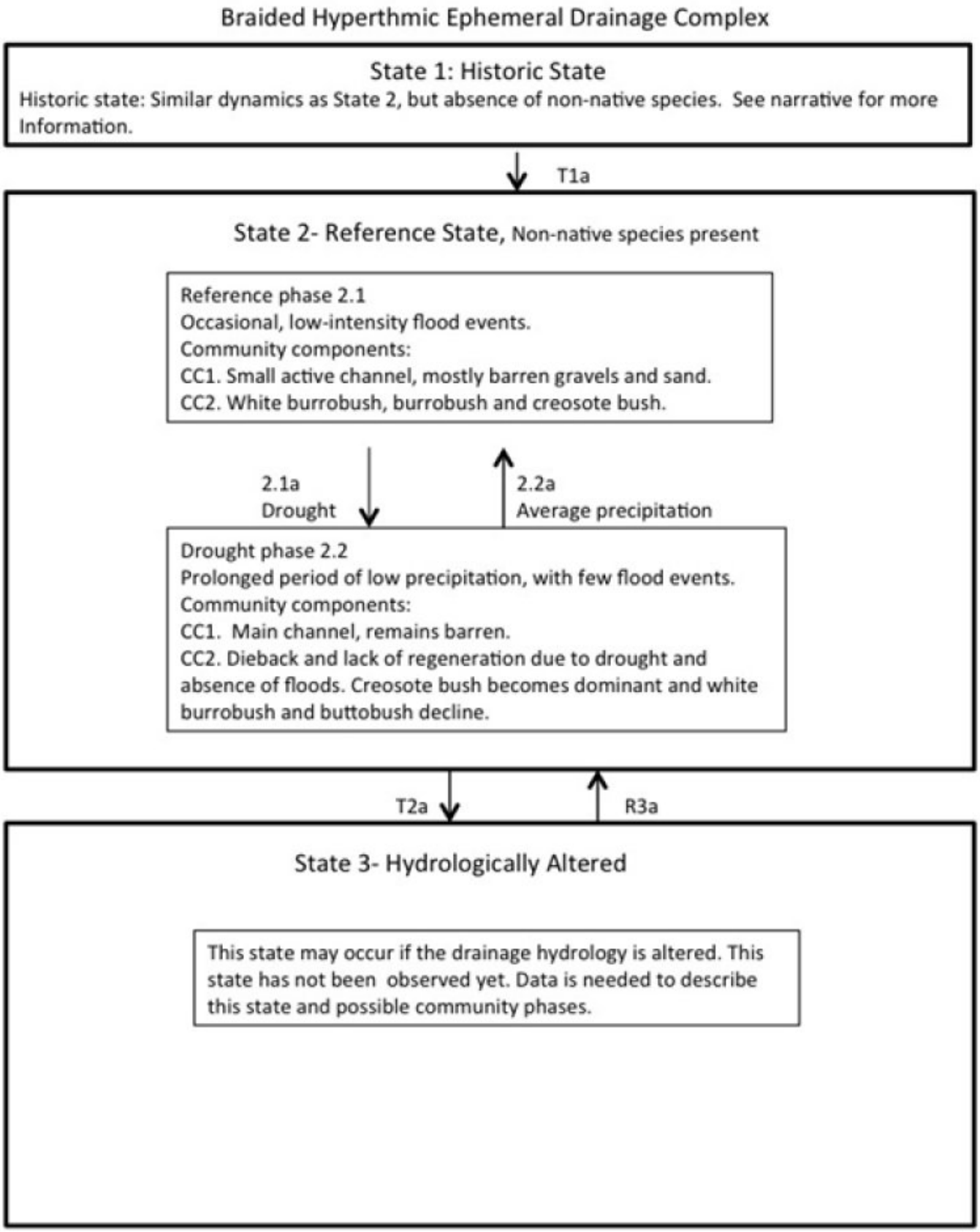

Figure 1. Braided Hyperthmic Ephemeral Drainage Complex

State 1
Historic State

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
Current potential State

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

Community 2.1
Current potential plant community

Figure 2. Community Phase 2.1

This community phase is dependent upon unimpaired hydrologic function and average to above average precipitation conditions. There are two community components associated with this community phase. Community component one is in the most actively flooded region of the drainageway, which is composed of barren sands and gravels. Community component two is adjacent to the active zone in the drainageway and on inset fans and sideslopes of the drainageway. White burrobush is generally dominant, and creosote bush and burrobush are common secondary shrubs. Desertsenna is often present but not abundant. Native annual forbs are present with adequate precipitation, and common species include desert Indianwheat (*Plantago ovata*), cryptantha (Cryptantha sp.), sandmat (Chamaesyce sp.), pincushion flower (*Chaenactis fremontii*), and birdcage evening primrose (Oenothera deltoids). The non-native annual grass Mediterranean grass is nauralized in this plant community.

Community 2.2
Drought impacted community

This community develops with prolonged or severe drought. Drought is an important shaping force in Mojave Desert plant communities (Webb et al. 2003, Bowers 2005, Hereford et al. 2006, Miriti et al. 2007). Short-lived perennials (such as white burrobush, burrobush, and desertsenna) 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). Long-lived shrubs (such as creosote bush) 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. White burrobush is a short-lived, drought-deciduous, disturbance adapted species that can readily establish when moisture is available (Tesky, 1993). It may experience high mortality during extreme drought, and an absence of flooding events will limit establishment opportunities for this species. Burrobush is a short-lived, shallow-rooted drought-deciduous shrub that is co-dominant with creosote bush over vast areas of the Mojave and Sonoran Deserts. During extreme or long periods of drought, it is subject to high mortality. Creosote bush is a long-lived, deep-rooted evergreen shrub dominant across vast areas of the North American warm deserts. Once established, it has very low levels of drought-induced mortality, and it is one of the few shrubs capable of persisting in this extreme environment. If drought persists or the channel becomes less active due to flow diversion, creosote bush may become the dominant species of this ecological site.

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 - State 3

This state may occur if the drainage hydrology is altered. This state has not been observed within Mojave National Preserve. Data is needed to describe this state and possible community phases. Headcutting may occur when drainages are bisected by roads and roadside ditches are manually created or created as a result of erosion from runoff. If the ditches have a lower base level for water flow the natural drainages may headcut to level out the channel gradient. Roads and ditches can either divert flow away from or concentrate flow to an area below the road. Loss of flow will cause species richness to decline, and the site will more closely resemble adjacent upland communities. Increased flow will cause the channel to erode, widening and/or downcutting to accommodate the increased flow. White burrobrush and desertsenna may increase in the disturbed drainageways.

Transition 1
State 1 to 2

This transition occurred with the naturalization of non-native species such as Mediterranean grass (*Schismus barbatus*) and red brome (*Bromus rubens*) in the Mojave Desert. This transition is not reversible.

Transition 2
State 2 to 3

Surface flow alterations can trigger a transition to State 3.

Additional community tables

Table 4. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
1	**Shrubs**			40–200	
	burrobrush	HYSA	*Hymenoclea salsola*	13–140	–
	burrobush	AMDU2	*Ambrosia dumosa*	30–60	–
	creosote bush	LATR2	*Larrea tridentata*	0–5	–
	desertsenna	SEAR8	*Senna armata*	0–2	–
Forb					
2	**Native Annual Forbs**			0–5	
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	0–1	0–1
	sandmat	CHAMA15	*Chamaesyce*	0–1	0–1
	pincushion flower	CHFR	*Chaenactis fremontii*	0–1	0–1
	cryptantha	CRYPT	*Cryptantha*	0–1	0–1
	birdcage evening primrose	OEDE2	*Oenothera deltoides*	0–1	0–1
	manybristle chinchweed	PEPA2	*Pectis papposa*	0–1	0–1
	desert Indianwheat	PLOV	*Plantago ovata*	0–1	0–1
Grass/Grasslike					
3	**Non-native annual grasses**			0–1	
	common Mediterranean grass	SCBA	*Schismus barbatus*	0–1	0–1

Inventory data references

Community Phase 2.1, 2012 Mojave National Preserve:

2012CA795112
2012CA795127
2012CA795150

Approval

Kendra Moseley, 2/18/2025

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	05/10/2025
Approved by	Kendra Moseley
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:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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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):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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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):**

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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:

    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:**