

# **Ecological site R030XY220CA**

## **Ustic Ephemeral Drainageways Order 2**

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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 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 and dry. Hyperthermic and thermic soil temperature regimes are common with exceptions at higher elevations (generally above 5000 feet) where mesic, cryic and frigid soil temperature regimes may occur. Typic aridic soil moisture regimes are common and widespread throughout the MLRA. 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**

The "XY" LRU is found throughout the Mojave Desert 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).

### **Classification relationships**

*Prunus fasciculata* - *Ambrosia eriocentra* Association (Sawyer et al. 2009).

### **Ecological site concept**

This ecological site describes the dynamics of a moderate sized eastern Mojave Desert ephemeral stream system. It occurs on drainageways (including associated landforms such as channels, terraces, inset fans) that are bound by steep alluvial walls or incised banks that drain fan remnants at elevations of approximately 3,400 to 5,500 ft. Drainageway slopes of 2 to 4 percent are typical. This site has an aridic bordering on ustic soil moisture regime. Soils are very deep, well to excessively drained sands with sandy and sandy skeletal particle size classes. Flood intensity, scour and sediment transport varies both spatially and temporally across the drainageway and along the channel segments, which creates a disturbance dependent complex of xeroriparian plant communities that may include barren active channels, occasionally to frequently flooded channel margins and low bars, and very rarely to rarely flooded terraces and high bars. The vegetation of ephemeral streams is determined by geographical location, drainage size (which affects water supply and disturbance frequency and intensity), elevation, topographic position (slope, type of watercourse), and soil properties (texture, bed materials, parent material) (Evens 2000, Levick et al. 2008, Stein et al. 2011). In this system moderate drainage sizes restrict vegetation to predominately drought-resistant shrubs, with water inputs not high enough to support trees. Dominant species in occasionally to frequently flooded positions (channel margins, low bars) include disturbance adapted shrubs such as woolly fruit bur ragweed,

desert almond, burrobush and purple sage. Rarely flooded higher bars and terraces support a productive community dominated by perennial grasses including black grama, big galleta and bush muhly. The relative composition of these communities is determined by time since disturbance and the intensity of disturbance events.

### Associated sites

R030XY219CA	<b>Ustic Ephemeral Drainageway Order 3</b> Occurs on nearby larger ephemeral drainageways. The channels of R030XY220CA often merges to form R030XY219CA. Desert willow ( <i>Chilopsis linearis</i> ) is a prominent species.
R030XB014NV	<b>SHALLOW GRAVELLY LOAM 7-9 P.Z.</b> Occurs on adjacent fan remnants with very deep loamy soils. Reference plants include blackbrush ( <i>Coleogyne ramosissima</i> ), black grama ( <i>Bouteloua eriopoda</i> ), and big galleta ( <i>Pleuraphis rigida</i> ).
R030XB015NV	<b>SHALLOW GRAVELLY SLOPE 7-9 P.Z.</b> Occurs on adjacent steep fan remnants and mountain slopes with shallow soils. Reference plants include blackbrush ( <i>Coleogyne ramosissima</i> ), black grama ( <i>Bouteloua eriopoda</i> ), and big galleta ( <i>Pleuraphis rigida</i> ).

### Similar sites

R030XY222CA	<b>Typic Aridic Ephemeral Drainageway Order 3 4-7" p.z.</b> This ecological site occurs on larger drainageways and has a typic aridic soil moisture regime.
R030XB051NV	<b>UPLAND WASH</b> Probably the same ecological site.
R030XY227CA	<b>Sandy Thermic Narrow Channels</b> This ecological site occurs on smaller, gently sloping, narrow, first and occasionally second order ephemeral drainageways. <i>Prunus emarginata</i> is a dominant shrub.
R030XY219CA	<b>Ustic Ephemeral Drainageway Order 3</b> Higher order drainages with desert willow and Mojave rabbitbrush. Community component 3 of this ecological site is similar to community component 2 in R030XY220CA.

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	(1) <i>Ambrosia eriocentra</i> (2) <i>Prunus fasciculata</i>
Herbaceous	(1) <i>Bouteloua eriopoda</i> (2) <i>Pleuraphis rigida</i>

### Physiographic features

This ecological site occurs on moderate sized (generally order 2) ephemeral drainageways and associated landforms at elevations of 3,410 to 5,510 feet. Slopes range from 2 to 15 percent, but slopes of 2 to 4 percent are typical. These drainageways experience very rare to frequent flash flooding that typically occur between December and March or between July and September. Runoff is negligible to low.

**Table 2. Representative physiographic features**

Landforms	(1) Drainageway (2) Channel (3) Inset fan
Flooding duration	Very brief (4 to 48 hours) to extremely brief (0.1 to 4 hours)
Flooding frequency	Very rare to frequent
Elevation	3,410–5,510 ft
Slope	2–15%

Climatic features

The climate of this ecological site is characterized by hot temperatures, aridity, and a bimodal precipitation pattern. Precipitation falls as rain, with 40 percent falling in summer between July and October, and 49 percent falling in winter between November and March. The mean annual precipitation is 10.5 inches and mean annual air temperature ranges from 55 to 63 degrees F.

Table 3. Representative climatic features

Frost-free period (average)	251 days
Freeze-free period (average)	305 days
Precipitation total (average)	10 in

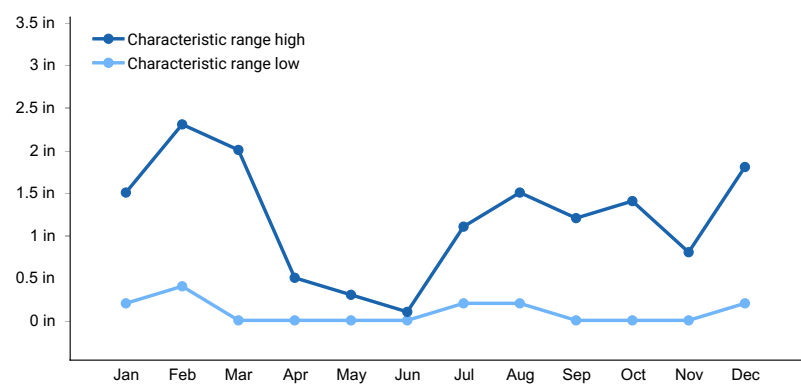


Figure 1. Monthly precipitation range

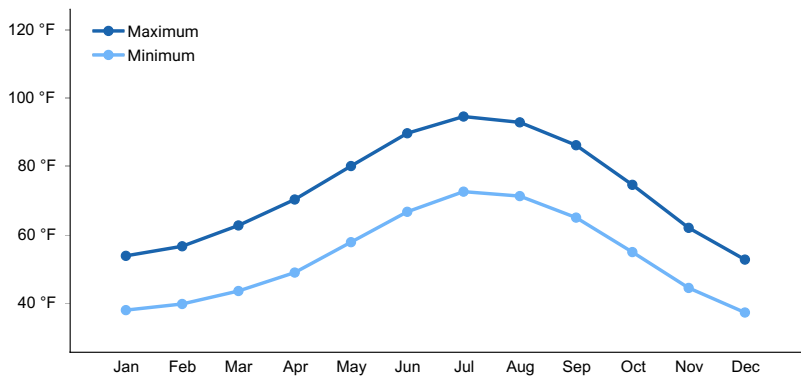


Figure 2. Monthly average minimum and maximum temperature

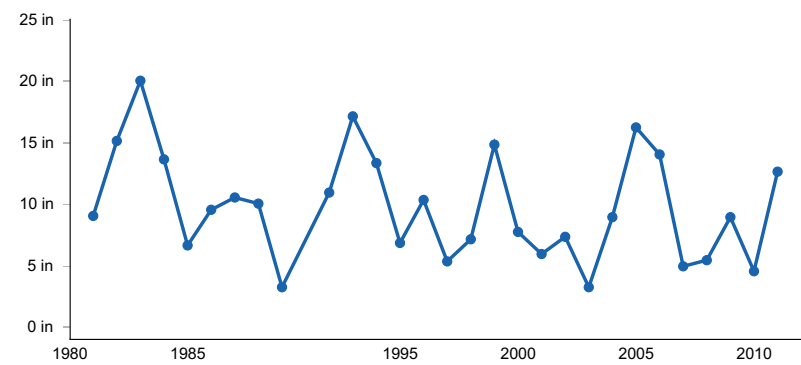


Figure 3. Annual precipitation pattern

Climate stations used

- (1) SEARCHLIGHT [USC00267369], Searchlight, NV
- (2) MITCHELL CAVERNS [USC00045721], Baker, CA

## Influencing water features

This ecological site is associated with moderate sized ephemeral stream systems, and includes associated channels, bars, stream terraces and inset fans.

## Soil features

The soils associated with this ecological site are very deep, well to excessively drained, and formed in alluvium from mixed parent material. The surface textures are sand, sandy loam, loamy sand, gravelly coarse sand and coarse sand. Subsurface horizons (1 to 59 inches) are composed of gravel and very gravelly sand. Surface rock fragments less than 3 inches in diameter range from 15 to 67 percent cover, and larger fragments range from 0 to 9 percent cover. Subsurface percent by volume of rock fragments less than 3 inches ranges from 27 to 36, and larger fragments range from 0 to 2.

Soils associated with this ecological site include Rocksalad (Sandy-skeletal, mixed, thermic Ustic Torriorthents), Boomerang (Sandy, mixed, thermic Ustic Torriorthents), and Arizo (Sandy-skeletal, mixed, thermic Typic Torriorthents). These soils are associated with all vegetation community components.

This ecological site is correlated with the following map units and soil components in the Mojave National Preserve Soil Survey: (Mapunit number; Mapunit name; Component; phase; component percent)

4300 ; Sagamore-Stonekey complex, 4 to 30 percent slopes ; Boomerang ; very rarely flooded ; 8  
205 ; Grottohill sandy loam, 2 to 8 percent slopes ; Boomerang ; rarely flooded ; 4  
201 ; Flyby gravelly sandy loam, 4 to 15 percent slopes ; Rocksalad ; rarely flooded ; 2  
404 ; Lecyr-Ustidur complex, 8 to 30 percent slopes ; Arizo ; occasionally flooded ; 1  
110 ; Vegasglow gravelly sandy loam, 15 to 50 percent slopes ; Boomerang ; occasionally flooded ; 1  
205 ; Grottohill sandy loam, 2 to 8 percent slopes ; Rocksalad ; occasionally flooded ; 1

**Table 4. Representative soil features**

Surface texture	(1) Sand (2) Sandy loam (3) Coarse sand
Family particle size	(1) Sandy
Drainage class	Well drained to excessively drained
Permeability class	Rapid
Soil depth	60 in
Surface fragment cover <=3"	15–67%
Surface fragment cover >3"	0–9%
Available water capacity (0-40in)	0.8–2.6 in
Calcium carbonate equivalent (0-40in)	0–3%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–4
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	27–36%
Subsurface fragment volume >3" (Depth not specified)	0–2%

## Ecological dynamics

Small ephemeral streams are often overlooked from an ecological and management perspective yet these streams may be more important than or at least as important as larger ephemeral streams because of the importance of water in the desert. Small ephemeral streams receive more frequent low flows relative to infrequent large flows in larger ephemeral streams (Griffiths et al. 2006, Levick et al. 2008). Although ephemeral stream processes are much more variable than perennial streams, a properly functioning ephemeral drainageway will provide similar hydrological and biological functions as perennial streams (Hild et al. 2007, Levick et al. 2008, Vyverberg 2010). 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. They also support a disproportionate share of biodiversity and provide important migration corridors for wildlife (Hild et al. 2007, Levick et al. 2008, Vyverberg 2010). 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.

Ephemeral streams flow only in response to rainfall events, and flow may last only minutes or days (Bull 1997, Levick et al. 2008, Vyverberg 2010). Extreme and rapid variations in flooding regime and a high degree of temporal and spatial variability in hydrologic processes are common in ephemeral wash systems (Bull 1997, Stanley et al. 1997, Levick et al. 2008, Shaw and Cooper 2008, Vyverberg 2010). Episodic high magnitude events that may occur only a few times a decade or a century function to 'reset' vegetation and channel form (Levick et al. 2008, Stein et al. 2011). Smaller more frequent flood events deposit sediment, leading to channel infilling and eventually 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) dynamics. As sediment deposits in the main channel of the depositional zone, and as vegetation colonizes stream channels, banks and bars, the likelihood of channel avulsion increases because of decreased channel volume (Levick et al. 2008).

The dynamic nature of ephemeral streams creates a complex of plant communities that do not conform to an equilibrium model and makes temporary channel development and configuration predictions difficult (Vyverberg 2010, Stein et al. 2011). Typical runoff events may result in an apparently stable mosaic of plant species distribution and channel configuration, while more extreme events may completely reconfigure the mosaic and establish the foundation of a new or modified plant community mosaic until the next extreme runoff event occurs. Vegetation communities reflect the time in the recurrence interval, or time between large magnitude 'reset' events. A low diversity of short-lived species will dominate areas shortly after a 'reset' event but long-lived species will increase over time to create a mixture of both short-lived and long-lived plant species. The late phase of the cycle is characterized by abundant vegetation with narrowing of the channel, making it more susceptible to resetting by a large flood.

Other disturbances such as drought, climate change, fire, grazing, mining, and land development can affect community composition and/or hydrologic process. Cycles of drought are inherent to the desert, and can cause significant mortality or die-back of vegetation (Hereford et al. 2006). Decreased vegetative cover can lead to an increase in erosion and change sediment deposition patterns, possibly increasing the chance of channel migration. Global climate change models for the southwest United States predict increased drought intensity, increased warming and drying, and greater variability in precipitation (Levick et al. 2008). These changes could lead to a decline in xeroriparian vegetation with greater intensity floods and erosion.

Ephemeral stream vegetation is determined by geographical location, drainage size (which affects water supply and disturbance frequency and intensity), elevation, topographic position (slope, type of watercourse), and soil properties (texture, bed materials, parent material) (Evens 2000, Levick et al. 2008, Stein et al. 2011). Differences in water availability and flooding disturbance distinguish xeroriparian vegetation from the surrounding landform vegetation which is evident by species composition, size, and production (Johnson et al. 1984, Levick et al. 2008). Plants protect soils from erosion and influence water flow by providing bank and channel roughness through channel bar formation and maintenance (Levick et al. 2008, Vyverberg 2010, Stein et al. 2011).

This ecological site describes the dynamics of a moderate sized eastern Mojave Desert ephemeral stream system. It occurs on drainageways (including associated landforms such as channels, terraces, inset fans) that are bound by steep alluvial walls or incised banks that drain fan remnants at elevations of approximately 3,400 to 5,500 ft. Drainageway slopes of 2 to 4 percent are typical. This site has an aridic bordering on ustic soil moisture regime. Soils are very deep, well to excessively drained sands with sandy and sandy skeletal particle size classes. Flood

intensity, scour and sediment transport varies both spatially and temporally across the drainageway and along the channel segments, which creates a disturbance dependent complex of xeroriparian plant communities (drought-tolerant vegetation within ephemeral streams) that may include barren active channels, occasionally to frequently flooded channel margins and low bars, and very rarely to rarely flooded terraces and high bars. Community components are used in this ecological site to represent the vegetation response to the various degrees of scour and sediment transport. Soil disturbance from flash flood events is the primary driver of plant community dynamics within this ecological site.

Several different ephemeral stream ecological sites are often connected to each other within the same watershed and given the dynamic nature of ephemeral stream systems community components of one ecological site may be ecologically similar to a community component of another ecological site. Although community components of ephemeral stream ecological sites are often portrayed in a lateral cross-section of the wash, community components also exist on a longitudinal basis as well; creating a very fuzzy boundary between the various ecological sites. Soils for both the Ustic Ephemeral Drainageways Order 2 (R030XY220CA) and the Ustic Ephemeral Drainageway Order 3 (R030XY219CA) ecological sites are very similar and management implications based on soil interpretations will be very similar but due to a growing understanding in the importance of desert washes these ecological sites have been created as separate entities based on the absence/presence of desert willow and Mojave rabbitbrush.

When two order 2 ephemeral streams merge an order 3 ephemeral stream is created. The order 3 ecological site, R030XY219CA, forms at higher elevations and the Mid-Elevation Riparian Complex 4-7" p.z. (R030XY222CA) forms at lower elevations both of which are larger drainageways with significant cover of desert willow. If the moderate sized order 2 drainages do not converge with other streams, surface flow eventually percolates out of the channel into substratum. Below this point the active channel becomes vegetated with stable upland vegetation, such as creosote bush (*Larrea tridentata*) shrubland.

In the Ustic Ephemeral Drainageways Order 2 system moderate drainage size restricts vegetation to predominately drought-resistant shrubs, with little water input to support phreatophytic trees. Dominant species in occasionally to frequently flooded positions (channel margins, low bars) include disturbance adapted shrubs such as woolly fruit bur ragweed, desert almond, burrobrush and purple sage. Rarely flooded higher bars and terraces support a productive community dominated by perennial grasses including black grama, big galleta and bush muhly.

Desert almond is a long-lived deep-rooted species diagnostic of episodic flooding (Stein et al. 2011). In the eastern Mojave Desert it is associated with the cooler temperatures and higher precipitation of upper fan piedmont positions, and gravelly soils (Evens 2000, Sawyer et al. 2009). Purple sage, woolly fruit bur ragweed and burrobrush are all shorter-lived, shallow-rooted species also diagnostic of episodic disturbance (Stein et al. 2011). Relatively high summer precipitation supports woolly fruit bur ragweed and black grama. Higher elevations and intermittent disturbance support purple sage. In the eastern Mojave Desert the desert almond – woolly fruit bur ragweed association is associated with confined channels located at mid elevations with coarse to medium sandy soils (Evens 2000). The relative composition of these communities is determined by time since disturbance and the intensity of disturbance events.

Intense lightning storms are common in the middle elevation desert shrubland and grassland. Large fires are likely to have been more common near this ecological site than at lower elevation sites (Mojave National Preserve 2004, Papierski 1993). Many large fire scars are visible in areas surrounding this ecological site in the mid-20th century aerial photos. The dominant species at this ecological site recover rapidly or increase in response to fire however loss of vegetation cover due to fire in the surrounding mountains and hills can contribute to increases in flooding events, sediment deposition, scouring of xeroriparian vegetation, channel avulsion and channel widening.

Livestock grazing has also impacted this ecological site. Ranching was established in the eastern Mojave desert in approximately 1875 (Nystrom 2003). Grazing occurred unregulated in the area until the passage of the Taylor Grazing Act in 1934, which divided public land into allotments that were regulated by the Bureau of Land Management (BLM), and among other things, called for fenced ranges and multiple developed water sources ([http://www.blm.gov/wy/st/en/field\\_offices/Casper/range/taylor.1.html](http://www.blm.gov/wy/st/en/field_offices/Casper/range/taylor.1.html)). The Federal Land Policy and Management Policy Act of 1976 (FLPMA) brought further regulations, including 10-year grazing permits. In 1994 the California Desert Protection Act created the Mojave National Preserve, and the National Park Service took over management of grazing allotments in much of the eastern Mojave.

Most of the area occupied by this ecological site within the Mojave National Preserve was retired from grazing in 2000 (Kim 2004), and ecological communities are still recovering, although wild burros remain at this site. Cattle and burros preferentially use riparian habitat because of access to water, shade, and productive vegetation (Kauffman and Kruegger 1984, Kie and Boroski 1996, Belsky et al. 1999). Livestock grazing can alter riparian vegetation species composition by selective grazing, plant cover removal, trampling stream banks, and compacting soil (Kauffman and Kruegger 1984, Trimble and Mendel 1995, Belsky et al. 1999). Increased runoff resulting from compacted soil and/or loss of vegetation may have led to channel incision, more intense flooding erosion, loss of sheet flow, and declining xeroriparian communities. Grazing in adjacent upland communities may have further increased runoff, erosion, and incision (Trimble and Mendel 1995, Belsky et al. 1999). There is great uncertainty as to the pre-European plant composition of this ecological site but riparian vegetation is resilient and remains distinct from the surrounding uplands, possibly attributable to both manmade and lightning fires in the area and the introduction of foreign ungulates into this ecological system.

Altered hydrological processes such as surface flow diversions, ground water depletion, and loss of the xeroriparian vegetation can have irreversible impacts such as headward erosion, increased flooding and sediment deposition, and/or channel abandonment (Nishikawa et al. 2004, Levick et al. 2008, and Stein et al. 2011). Impermeable surfaces (such as pavement, homes, malls, etc.) reduces soil water infiltration, creates higher runoff, greater peak flows, and more frequent high intensity flooding events (Levick et al. 2008). Stream channelization also increases flood intensity and sediment transport within some reaches, while reducing flow to other reaches. Dams and improperly constructed roads and railroads can cause aggradation and flooding upstream, channel incision and channel abandonment downstream (Levick et al. 2008). Channel abandonment, incision and/or significant reductions in flow can convert xeroriparian vegetation communities to upland communities by altering traditional flow patterns. Channel incision may also scour channel features and lead to more frequent high intensity floods, reduce channel vegetation diversity and create a community dominated by short-lived species that can withstand the new flooding regime.

When disturbances such as those described above affect the hydrologic function of this ephemeral stream system, this ecological site has the potential to transition to hydrologically altered States 2 and 3. Data are not available to describe these altered states, and they are described in general terms as provisional states in the state-and-transition model.

## **State and transition model**

State-Transition Model - Ecological Site R030XY220CA  
 Confined Mid Size Ustic Ephemeral Drainageways  
 Ambrosia eriocentra – Prunus fasciculata/Bouteloua eriopoda – Pleuraphis rigida  
 (Woolly fruit bur ragweed – desert almond/black grama – big galleta)

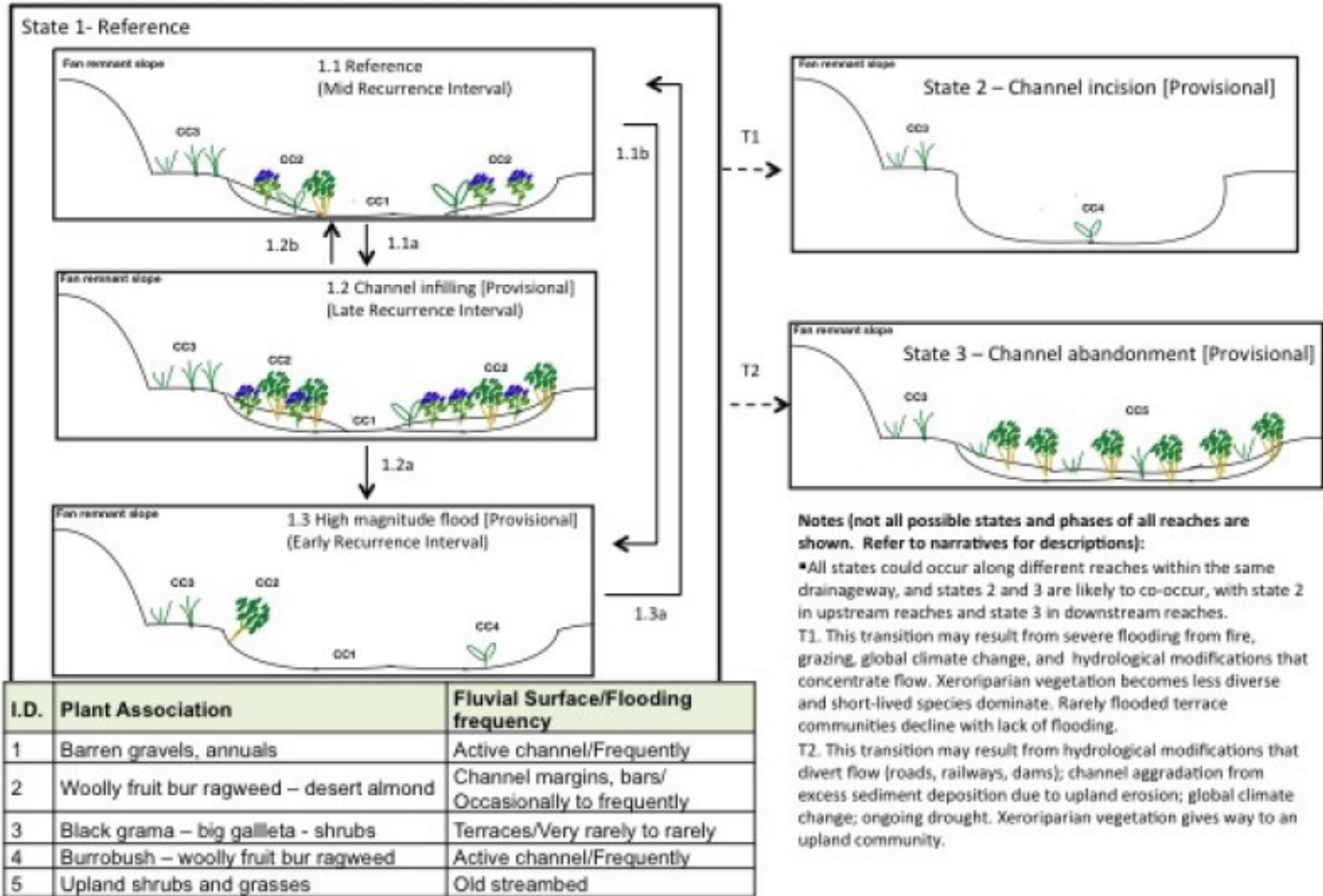


Figure 5. R030XY220CA

State 1  
Reference

This state is maintained by unimpaired hydrologic function. It is characterized by a high degree of natural variability, with infrequent large magnitude flooding events periodically 'resetting' channel morphology and vegetation communities. More frequent smaller scale events interact with channel vegetation to increase channel complexity with time since a large event.

Community 1.1  
Reference





Figure 6. Community Component 1 and 2



Figure 7. Community Component 3

Although equilibrium conditions and a traditional climax community do not occur within this ecological site, this community phase is most typical for the majority of the recovery period between large high magnitude flood events. Community components are used in this ecological site to represent the vegetation response to the various degrees of scour and sediment transport. At any given point along the stream the following community components are generally present. The relative spatial extent of these communities varies as the channel morphology fluctuates from flooding events, and with time since flood events. Steeper reaches may be more incised with less chance of sheet flow out of the main channel; these reaches tend to have a higher abundance of bare gravels and sparser vegetation, with less of the rarely flooded community component (community component 3). In lower slope reaches sediment fills the main channel, increasing the chance of sheet flow across the area. A broader area of disturbance supports more xeroriparian vegetation. Stable terraces are more likely to occur on the inside of meanders and along the banks of straight channel reaches. Three community components are present, including: Community Component, 1 Frequently Flooded Active Channel This area is dominated by barren gravels and sand. There is very little vegetation in this zone due to frequent scouring from floods. At the upper reaches of this site there is generally one main active channel. However in deposition zones, the main channel may migrate into new or old channels within the braided channel system. These gravels may support a high diversity of native annual forbs during high precipitation years but no observations have confirmed this. Community Component 2, Occasionally to Frequently Flooded Bars/Channel Margins/Inset Fans This community is dominated by woolly fruit bur ragweed, desert almond, purple sage, burrobush and mixed shrubs. It occurs on occasionally to frequently flooded channel margins and bars within the channel. Regular flooding keeps production in this community relatively low. The dominant shrubs are all adapted to regular soil disturbance. Catclaw acacia (*Acacia greggii*) may be present in more active reaches. Upland shrubs including Nevada jointfir (*Ephedra nevadensis*), Cooper's goldenbush (*Ericameria cooperi*), Eastern Mojave buckwheat (*Eriogonum fasciculatum*), threadleaf snakeweed (*Gutierrezia microcephala*), water jacket (*Lycium andersonii*), buckhorn cholla (*Cylindropuntia acanthocarpa*), grizzlybear pricklypear (*Opuntia polycantha* var. *erinacea*), and banana yucca (*Yucca baccata*) may be present, among others. Jaeger's Joshua tree (*Yucca brevifolia* var. *jaegeriana*) may be sparsely present. Perennial grasses, although generally sparsely distributed, are a significant component of this community phase. Desert needle grass (*Achnatherum speciosum*) is the most abundant perennial grass. Community Component 3, Very Rarely to Rarely Flooded Terraces This community is present on rarely flooded terraces and higher, more stable bars. It is adjacent to the channel margins or in lower areas where sheet flow spreads across the site. It has less water availability than the active channel. Very rare to rare flooding provides surface disturbance that favors the establishment of shorter-lived species such as burrobush, and the increased water availability increases production relative to adjacent uplands. Perennial grasses, including black grama, big galleta, and bush muhly are the dominant component of this community, and burrobush and Nevada ephedra are important shrubs. Forbs are a minor component of this community, with wishbone-bush (*Mirabilis laevis* var. *villosa*), and desert globemallow (*Sphaeralcea ambigua*) commonly present. Jaeger's Joshua tree is more abundant in this more stable community. Red brome and redstem stork's bill may be abundant.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	72	120	180
Shrub/Vine	35	50	65
Forb	0	5	12
<b>Total</b>	<b>107</b>	<b>175</b>	<b>257</b>

## Community 1.2

### Channel infilling [Provisional]

This community phase is characterized by channel infilling and narrowing by increases in stream vegetation. It typically occurs late in the recurrence interval between large flooding events where repeated smaller floods have resulted in sediment deposition and an increasing number of plants trapped sediment in channel bars. Long-lived species like desert almond become more dominant while species requiring frequent disturbance and barren gravels such as burrobrush become less important. Upland species may become more prevalent. This phase is susceptible to the effects of large magnitude floods because narrower channels have reduced flow capacity. The following community components are present: CC1, Frequently Flooded Active Channel The active channel has narrowed in this phase. CC2, Occasionally to Frequently Flooded Bars/Channel Margins/Inset Fans This community expands and becomes dominant in this phase. Longer-lived species are dominant. CC3, Very Rarely to Rarely Flooded Terraces This community phase is relatively stable, but may expand into more stabilized outer stream banks.

## Community 1.3

### Large magnitude flood [Provisional]

This community phase occurs after a large magnitude flood event that clears most of the channel vegetation and channel features. Data are not available to determine the range of frequency of these events, but they are likely decadal or longer. A channel dominated by barren gravels characterizes this community phase. The following community components are present: CC1, Frequently Flooded Active Channel The newly scoured channel dominates the drainageway, and very little vegetation is present due to recent scouring and/or sediment deposition. These gravels contain a seed bank for colonizing vegetation (Stromberg et al. 2009), which thrive in freshly deposited sediment. These gravels may support a high diversity of native annual forbs during high precipitation years but high forb cover has not yet been observed at this community component. CC2, Occasionally to Frequently Flooded Bars/Channel Margins/Inset Fans This community is absent or very small in this phase. A few shrubs are likely to remain in scattered locations along streambanks. Desert almond is capable of resprouting after mechanical damage, and will recolonize from rootstocks as well as seed dispersed along the channel (Sawyer et al. 2009). Catclaw acacia will also resprout. CC3, Very Rarely to Rarely Flooded Terraces This community phase is relatively stable, but if the flood was large enough it may decline due to scouring or sediment deposition. Community component 4 (CC4), Frequently Flooded Channels/Low Bars This community component is dominated by short-lived shrubs such as burrobrush, woolly fruit bur ragweed and purple sage. Burrobrush will colonize fresh gravels from seed. Rootstock of woolly fruit bur ragweed and purple sage may survive in patches along the channel, and will resprout. These patches of colonizing vegetation trap sediment and influence flow, facilitating the development of channel bars and further vegetation establishment.

## Pathway 1.1a

### Community 1.1 to 1.2

Occurs with a long period of time without a large magnitude flood event. Recurrent cycles of deposition from smaller more frequent flood events leads to vegetation colonization and channel infilling.

## Pathway 1.1b

### Community 1.1 to 1.3

Occurs with a large magnitude flood event that removes the majority of channel vegetation and structures.

## Pathway 1.2b

## Community 1.2 to 1.1

Occurs with a flood event large enough to partially remove channel vegetation and structures.

### Pathway 1.2a

#### Community 1.2 to 1.3

Occurs with a large magnitude flood event that removes most channel vegetation and structures.

### Pathway 1.3a

#### Community 1.3 to 1.1

Occurs with time, channel topographical feature development and expansion of xeroriparian vegetation

## State 2

### Channel incision [Provisional]

A confined channel, lowering of the complexity of ecological communities with dominance by short-lived pioneering species, and a decline in xeroriparian plant vigor on rarely flooded terraces characterizes this state. Modifications such as dam building, railroads, roads, and drainage ditches will impact the function of these drainageways (Levick et al. 2008, Stein et al. 2011). Railroads established in the Mojave Desert in the early 1900's impacted thousands of smaller drainageways, causing aggradation on upslope positions (Griffiths et al. 2006), and channel abandonment and loss or decline of xeroriparian vegetation on downslope positions. Fire in upland communities, especially on the adjacent mountain slopes that provide run-off and sediment to this site, is likely to increase the severity and frequency of high magnitude flood events, and result in increased sediment deposition (Stein et al. 2011). Grazing in upland communities may also increase flooding and sediment deposition (Trimble and Mendel 1995, Belsky et al. 1999). Both fire and grazing may also result in channel incision in different reaches, especially those that are higher in elevation and/or narrow.

## State 3

### Channel abandonment [Provisional]

An abandoned channel and the conversion of xeroriparian vegetation to an upland community characterize this state. Modifications such as dam building, railroads, roads, and drainage ditches will impact the function of these drainageways (Levick et al. 2008, Stein et al. 2011). Railroads established in the Mojave Desert in the early 1900's impacted thousands of smaller drainageways, causing aggradation on upslope positions (Griffiths et al. 2006), and channel abandonment and loss or decline of xeroriparian vegetation on downslope positions.

## Transition T1

### State 1 to 2

This transition may occur with severe flooding due to loss of soil stability from fire, grazing, global climate change, and hydrological modifications that concentrate flow.

## Transition T2

### State 1 to 3

This transition may occur with hydrological modifications that divert flow (roads, railways, dams); channel aggradation from excess sediment deposition due to upland erosion; global climate change; or ongoing drought.

## Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
2	CC2 Shrubs			35–65	

3	CC3 Shrubs			210–390	
Grass/Grasslike					
2	CC2 Grasses			72–180	
	burrobrush	HYSA	<i>Hymenoclea salsola</i>	50–225	5–40
	woolly fruit bur ragweed	AMER	<i>Ambrosia eriocentra</i>	50–150	2–15
	desert almond	PRFA	<i>Prunus fasciculata</i>	20–120	1–8
	desert needlegrass	ACSP12	<i>Achnatherum speciosum</i>	5–100	0–2
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	10–50	2–4
	purple sage	SADO4	<i>Salvia dorrii</i>	20–40	2–4
	Cooper's goldenbush	ERCO23	<i>Ericameria cooperi</i>	0–30	0–4
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	0–30	0–3
	red brome	BRRU2	<i>Bromus rubens</i>	0–30	0–2
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–25	0–1
	big galleta	PLRI3	<i>Pleuraphis rigida</i>	0–20	0–2
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–20	0–2
	catclaw acacia	ACGR	<i>Acacia greggii</i>	0–20	0–2
	Eastern Mojave buckwheat	ERFA2	<i>Eriogonum fasciculatum</i>	0–15	0–1
	water jacket	LYAN	<i>Lycium andersonii</i>	0–15	0–1
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	0–10	0–1
	sixweeks grama	BOBA2	<i>Bouteloua barbata</i>	0–10	0–1
	desert globemallow	SPAM2	<i>Sphaeralcea ambigua</i>	0–6	0–1
	sandmat	CHAMA15	<i>Chamaesyce</i>	0–5	0–1
	black grama	BOER4	<i>Bouteloua eriopoda</i>	1–5	0–1
	grizzlybear pricklypear	OPPOE	<i>Opuntia polyacantha</i> var. <i>erinacea</i>	0–5	0–1
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	0–5	0–1
	threadleaf snakeweed	GUMI	<i>Gutierrezia microcephala</i>	0–5	0–1
	banana yucca	YUBA	<i>Yucca baccata</i>	0–5	0–1
	Joshua tree	YUBR	<i>Yucca brevifolia</i>	0–5	0–1
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–1	0–1
	redstem stork's bill	ERCI6	<i>Erodium cicutarium</i>	0–1	0–1
	buckwheat	ERIOG	<i>Eriogonum</i>	0–1	0–1
	wishbone-bush	MILAV	<i>Mirabilis laevis</i> var. <i>villosa</i>	0–1	0–1
	desert Indianwheat	PLOV	<i>Plantago ovata</i>	0–1	0–1
3	CC3 Grasses			390–520	
Forb					
2	CC2 Forbs			0–12	
	Joshua tree	YUBR	<i>Yucca brevifolia</i>	20–115	1–3
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	50–105	2–4
	big galleta	PLRI3	<i>Pleuraphis rigida</i>	40–80	1–6
	burrobrush	HYSA	<i>Hymenoclea salsola</i>	35–65	3–20
	red brome	BRRU2	<i>Bromus rubens</i>	0–50	0–10
	bush muhly	MUPO2	<i>Muhlenbergia porteri</i>	20–30	1–5
	Virgin River brittlebush	ENV1	<i>Encelia virginensis</i>	0–30	0–1

	virgin river brittlebush	ERVI1	<i>Eriocaulon virginensis</i>	0–30	0–1
	redstem stork's bill	ERIC6	<i>Erodium cicutarium</i>	0–20	0–12
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–20	0–1
	threadleaf snakeweed	GUMI	<i>Gutierrezia microcephala</i>	9–16	0–2
	littleleaf ratany	KRER	<i>Krameria erecta</i>	0–15	0–1
	water jacket	LYAN	<i>Lycium andersonii</i>	0–5	0–2
	peach thorn	LYCO2	<i>Lycium cooperi</i>	0–5	0–1
	desert almond	PRFA	<i>Prunus fasciculata</i>	0–5	0–1
	purple sage	SADO4	<i>Salvia dorrii</i>	0–5	0–1
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–5	0–1
	Eastern Mojave buckwheat	ERFA2	<i>Eriogonum fasciculatum</i>	0–5	0–1
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–5	0–1
	buck-horn cholla	CYAC8	<i>Cylindropuntia acanthocarpa</i>	0–5	0–1
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–5	0–1
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	0–5	0–1
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–5	0–1
	Cooper's dogweed	ADCO2	<i>Adenophyllum cooperi</i>	0–5	0–1
	desert trumpet	ERIN4	<i>Eriogonum inflatum</i>	0–5	0–1
	desert globemallow	SPAM2	<i>Sphaeralcea ambigua</i>	0–5	0–1
	Mojave woodyaster	XYTO2	<i>Xylorhiza tortifolia</i>	0–5	0–1
	desert Indianwheat	PLOV	<i>Plantago ovata</i>	0–1	0–1
	woollystar	ERIAS	<i>Eriastrum</i>	0–1	0–1
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	0–1	0–1
3	CC3 Forbs			0–35	
Tree					
3	CC3 Trees			20–115	

## Animal community

Small animals live in this ecological site. Animal diversity in this ecological site is likely high relative to upland areas due to the heterogeneity of the site and the availability of forage and water. Streambanks provide habitat for burrows. 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

These drainageways provide open travel corridors for cross-country hiking. Wildflower displays may be abundant after adequate precipitation.

## Other products

Purple sage has many medicinal uses, and was/is used extensively by Native Americans.

## Inventory data references

High intensity sampling (Caudle et al. 2013) was used to describe this ecological site. Site characteristics such as aspect, slope, elevation and UTMS were recorded for each plot, along with complete species inventory by ocular percent cover. The line-point intercept method was used to measure foliar cover, groundcover, and vegetation structure. At either 300 or 100 points along a 600- or 400-foot step transect, ground cover and intercepted plant species were recorded by height. The first hit method (Herrick et al. 2009) was used to generate the foliar cover values entered in the community phase composition tables. Annual production was estimated using the double-weight sampling method outlined in the National Range and Pasture Handbook and in Sampling Vegetation Attributes (NRCS 2003 and Interagency Technical Reference 1999 pgs. 102 - 115). For herbaceous vegetation, ten 9.6 square foot circular sub-plots were evenly distributed along a 200 foot transect. For woody and larger herbaceous species production was estimated in four 21'X21' square plots along the same transect. Weight units were collected for each species encountered in the production plots. The number of weight units for each species is then estimated for all plots.

Community Phase 1.1

CC2

11CA795110

2012CA795244

11CA795233\_Occ\_fl

CC3

11CA795233

2012CA795246

## Type locality

Location 1: San Bernardino County, CA	
UTM zone	N
UTM northing	3911720
UTM easting	671099
General legal description	The type location is within the Mojave National Preserve. Approximately 8 miles east of the intersection of Hart Mine Road and Ivanpah road, and 0.4 miles at a bearing of 126 degrees from Hart Mine Road.

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## Contributors

Alice Miller

## Approval

Sarah Quistberg, 2/24/2025

## 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	05/12/2025
Approved by	Sarah Quistberg
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):**

---

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:**
-