Ecological site R030XB186CA
Mid Size Thermic To Hyperthermic 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.

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 LRUs 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 describes the complex dynamics of first and second order ephemeral streams with disturbances dominated by flash flood events. These streams have a catchment size ranging from 1,000 to 5,000 acres. This site occurs in channels, drainageways and inset fans on fan piedmonts. It may have either hyperthermic or thermic soil temperatures, and 3 to 7 inches mean annual precipitation (MAP). Soils are very deep, somewhat excessively or excessively drained, and have sand, loamy sand or very gravelly sand textures. Conceptually, this ecological site accommodates all community components and community phases of the ephemeral stream. The community components occur in conjunction with channel development processes and attending disturbance, occurring in association with channels cut within stable fan remnants leading to depositional braided channels lower on the alluvial fan. The site is a complex of consistent plant communities including catclaw acacia (*Acacia greggii*) on active channel margins, a catclaw acacia-burrobrush (*Hymenoclea salsola*) community on lower relief depositional bars, and creosote bush (*Larrea tridentata*)- burrobrush mixed shrub community on semi-stable, higher relief, depositional bars. Elevations range from 1,150 to 5,740 feet, with representative slope ranges of 2 to 8 percent.

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: R030XA065NV, R030XA076NV, , R030XY186CA, R030XB138NV, R030XC005NV, R030XY187CA, R030XY202CA

Associated sites

R030XB140CA	**Shallow Hill 4-6" P.Z.** This ecological site is on surrounding hills within the warm-thermic temperature zone, and is dominated by creosote bush and burrobrush.
R030XB174CA	**Sandy Fan Aprons** This ecological site is on thermic alluvial fans, with creosote bush and Joshua tree.
R030XB191CA	**Sandy Pediment** This ecological site is on thermic pediments, with a thin eolian sand surface, with blackbrush, creosote bush, and big galleta.
R030XD003CA	**Hyperthermic Steep South Slopes** This ecological site in on hyperhtermic hills, dominated by brittlebrush and creosote bush.
R030XD006CA	**Abandoned Fan** This ecological site is on hyperthemic alluvial fans and has low cover of creosote bush.
R030XD015CA	**Hyper-Arid Fans** This ecological site is on hyperthemic fan aprons and has creosote bush and burrobrush.

Similar sites

R030XY202CA	**Very Rarely To Rarely Flooded Thermic Ephemeral Stream** This rarely to very rarely flooded wash is at higher elevations and is dominated by Nevada jointfir (Ephedra nevadensis) and mixed shrubs, It is generally found on gently sloping upper headwater on alluvial fans.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Acacia greggii* (2) *Hymenoclea salsola*
Herbaceous	Not specified

Physiographic features

This ecological site occurs in channels, drainageways, and inset fans. It occurs at elevations of 1,150 to 5,740 feet and has slopes ranging from 0 to 30 percent, but slope of 2 to 8 percent are more typical. This site has rare to frequent flooding with extremely brief to very brief duration, and negligible to low runoff.

Table 2. Representative physiographic features

Landforms	(1) Drainageway (2) Channel (3) Inset fan
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	Rare to frequent
Ponding frequency	None
Elevation	351–1,750 m
Slope	0–30%
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 13 to 23 degrees C. (55 to 73 degrees F.), and the frost-free season is 210 to 340 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)	178 mm

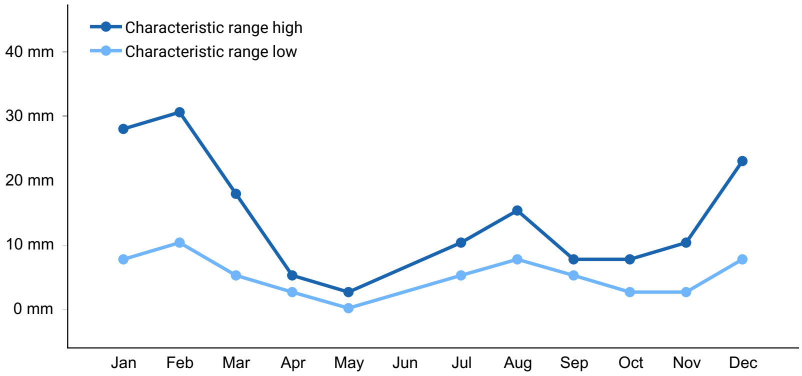

Figure 1. Monthly precipitation range

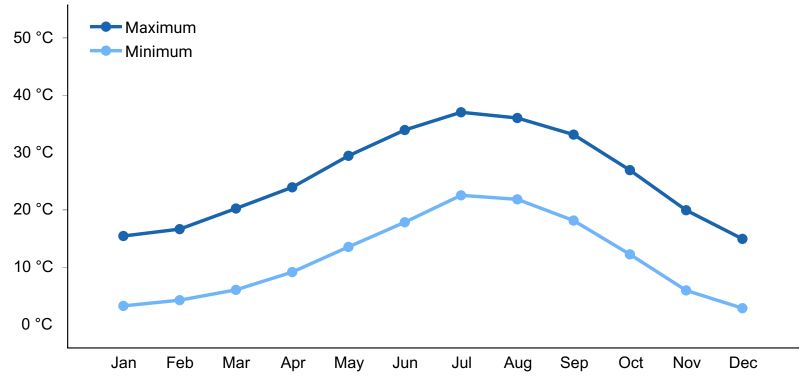

Figure 2. Monthly average minimum and maximum temperature

Influencing water features

This ecological site is associated with moderate-sized ephemeral stream systems, and includes associated channels, drainageways and inset fans. These streams have frequent, small, flash-flood and occasional larger flash-flood events, which provide surface flow several hours to a maximum of two days after precipitation.

Soil features

The soils associated with this site are very deep, sandy soils formed in alluvium dominantly from granitoid and/or gneiss. They are excessively to somewhat excessively drained with rapid permeability. They have minimal soil development. The surface textures are sand, gravelly sand, very gravelly sand, loamy sand or extremely gravelly loamy sand. The subsurface textures (from depths of 2 to 59 inches) are sandy with range from non-gravelly to extremely gravelly textures. The surface cover of rock fragments less than 3 inches in size ranges from 20 to 75 percent, and surface rock fragments greater than 3 inches range from 0 to 40 percent. Subsurface rock fragments (from depths of 2 to 59 inches) less than 3 inches in size range from 2 to 65 percent by volume and rock fragments greater than 3 inches in size range from 0 to 25 percent.

This ecological site is associated with the following soil series: Arizo (sandy-skeletal, mixed, thermic Typic Torriorthents), Carrizo (sandy-skeletal, mixed, hyperthermic Typic Torriorthents), Cajon (mixed, thermic Typic Torripsamments), Morongo (mixed, thermic Typic Torripsamments), and to a minimal extent, Pintobasin soils (mixed, hyperthermic Typic Torripsamments). The Arizo and Carrizo soils are skeletal soils with more than 35 percent rock fragments throughout the soil particle size control section, and the Cajon, Morongo, and Pintobasin soils are sandy, but not skeletal.

This ecological site is associated with a major soil component in following map units within the Joshua Tree National Park Soil Survey (CA794):

Map unit ID; Map unit name; Component; Phase; Percent
1513;Carrizo-Rubylee complex, 1 to 4 percent slopes; Carrizo; occasionally flooded, channeled ;20
4403;Arizo complex, 2 to 8 percent slopes; Arizo; rarely flooded; 25

This ecological site is associated with an additional 43 map unit with minor components including: Arizo rarely flooded; Cajon rarely flooded; Cajon occasionally flooded; Carrizo; occasionally flooded; Carrizo occasionally flooded, channeled; Carrizo occasionally flooded narrow; Morongo rarely flooded; and Pintobasin occasionally flooded, narrow.

Table 4. Representative soil features

Surface texture	(1) Very gravelly sand (2) Extremely gravelly sand (3) Loamy sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained to excessively drained
Permeability class	Rapid
Soil depth	152 cm
Surface fragment cover <=3"	20–75%
Surface fragment cover >3"	0–40%
Available water capacity (0-101.6cm)	1.02–7.87 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	6–8.4
Subsurface fragment volume <=3" (Depth not specified)	2–65%
Subsurface fragment volume >3" (Depth not specified)	0–25%

Ecological dynamics

This ecological site describes the dynamics of a moderate sized ephemeral stream system. This site has hyperthermic and thermic soil temperature regimes. Elevations range from 1,390 to 5,740 feet. The unifying feature is the moderate drainage size, of approximately 1,000 to 5,000 acres (based on GIS analysis of catchment size), and the dominance of catclaw acacia.

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).

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 include a constant flux of balancing erosional and depositional channel reaches. As sediment deposits in the main channel of the depositional zone, the likelihood of channel avulsion increases because of decreased channel volume. Cycles of channel avulsion on alluvial fans is 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 very rapidly and dramatically exceeded.

If channel avulsion occurs at the apex of the alluvial fan, it is more likely to capture the majority of the stream flow. Upper fans extend into the base of mountains, which provide a direct sediment source, which is transported over time, by larger flood events, to distal reaches of the drainage. This ecological site occurs on channels on the upper fan piedmont as well as distal reaches of the fan piedmont. The moderate sized ephemeral stream complex that comprises this ecological site may merge with another similar sized stream and develop the Large, Thermic, Sandy Ephemeral Stream (R030XY167CA) ecological site, which is generally in wider valleys with higher cover of desert willow. If these moderate sized 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.

Water availability, sediment flux, and channel migrations result in a dynamic complex of hydrologically and disturbance determined plant communities. Physical disturbance of soils as a result of flash flooding makes predictability of temporary channel development and configuration very low except when considered at a very coarse scale. 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.

Catclaw acacia is persistently present with high cover along the active channel margins. Catclaw acacia is not an obligate riparian species, but usually reaches dominance only where there is regular flooding, or where surface fragments channel water (Sawyer et al. 2009). Localized areas with more frequent flooding or a deep water source (e.g., at a break in slope at the mountain base) may have small patches of desert willow (*Chilopsis linearis*). As flooding dissipates or is less frequent, communities comprised of both pioneer and upland species becomes dominant. Dominant plants are burrobrush (*Hymenoclea salsola*) and creosote bush (*Larrea tridentata*), but a diverse shrub assemblage is typical.

Other disturbances such as drought, fire, and human hydrologic alterations can affect the community composition and/or hydrologic process. Drought is common in the desert, and can cause mortality or die-back of vegetation. Decreased vegetative cover can lead to increase in 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.

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 drought-tolerant vegetation that borders 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 (Levick, et al., 2008 and Johnson et al., 1984). Xeroriparian vegetation is present because the increased availability of water and flood disturbances in these drainageways. The structure and forage provided by xeroriparian vegetation, and the availability of water (although brief), significantly increases animal abundance along ephemeral streams relative to upland areas. The open channels 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 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. 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 xeroriparian 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 xeroriparian community is lost, important animal species dependent upon this community may be lost from the area as well. Ground water drawdown from household wells (Nishikawa et al. 2004) can deplete the water source for deep rooted species such as desert willow and catclaw acacia potentially eliminating this species from certain areas.

State and transition model

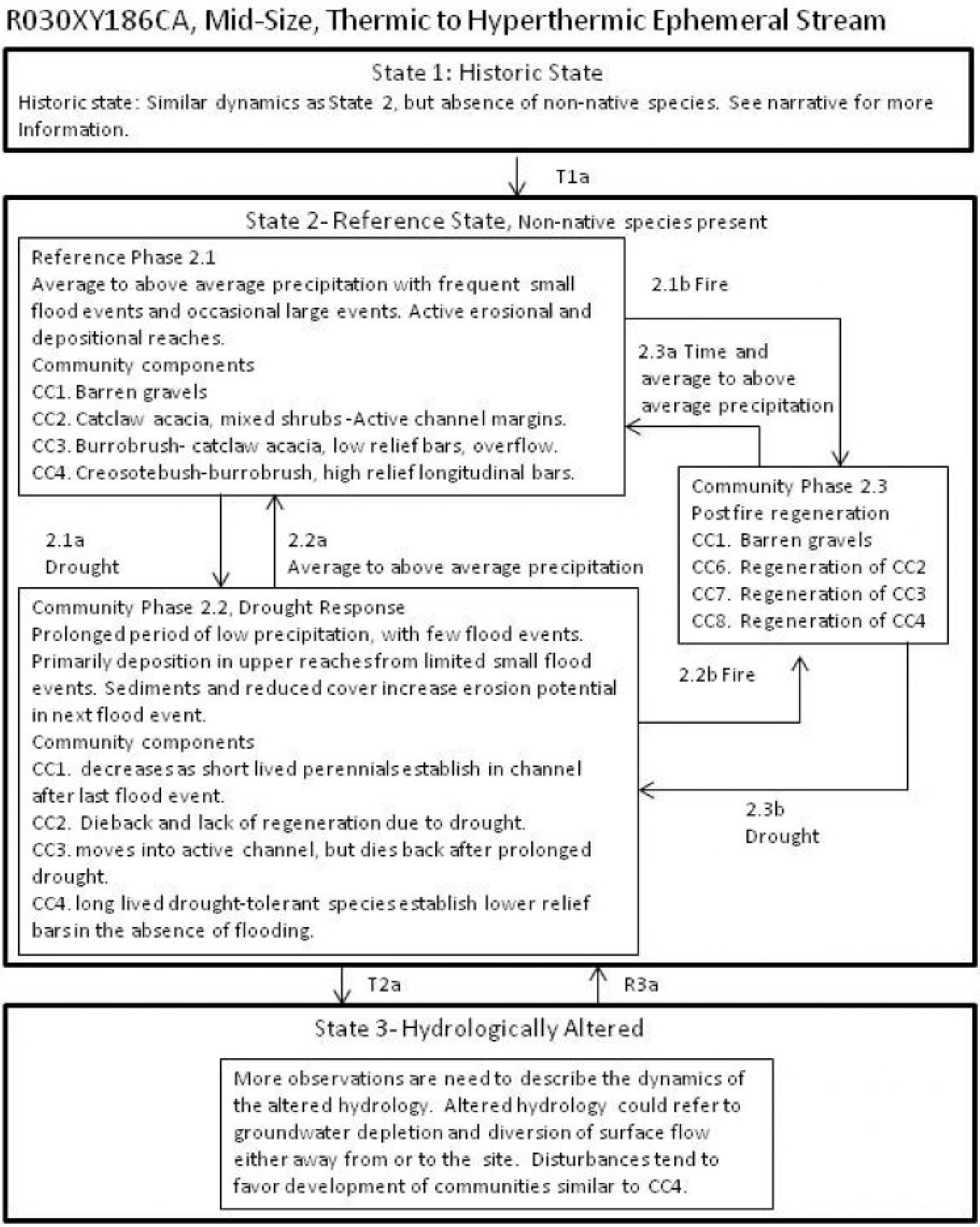

Figure 3. R030XY186CA Model

State 1
Historic

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

State 2
Reference State

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

Community 2.1
Reference Phase

Figure 4. CC1 (active channel) and CC2 (channel margins)

Figure 5. CC4 Stable Terrace

Figure 6. CC3 Active Terrace

This community phase is dependent upon unimpaired hydrologic function and average to above average precipitation. Site specific historical data to determine flood size or frequency is difficult to find. However, historic precipitation data and runoff frequency calculated by measuring sediment deposits indicate greater than one inch precipitation events and runoff events occur in about 4.5 to 5 year intervals (Griffeths et al. 2006). Precipitation events of greater than one inch would flood the active channel, and extend to some portions of the higher relief sediment bars. It is difficult to determine the frequency of large flood events, which would have enough volume to overflow onto the upper topographic positions. Precipitation of less than an inch occurs more often and may create surface flow in the active channel. 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 flash flood events. Steeper reaches may be more incised with less chance of sheet flow over the banks. In lower slope reaches sediment fills the main channel, increasing the chance of sheet flow across the area. Areas with sheet flow have a higher area of surface disturbance and will have more disturbance dependent species. Four community components are present, including: Community Component 1 (CC1) Active Wash 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. Community Component 2 (CC2) Active Channel Margins This community is dominated by catclaw acacia and mixed shrubs. It is on the active channel margins. This community is dominated by catclaw acacia. The larger shrubs on this site are long-lived with shallow and deep roots. Their roots provide a strong deep anchor, stabilize the stream margins, and capture sediments. In the event of a large flood event, catclaw acacia, jojoba, desert almond, and desert willow can resprout from the root crown after being top-killed or injured by floods. Floods also initiate regeneration from seed. The seeds of catclaw acacia, jojoba, and desert almond are relatively large and are dependent on gravity, floods or animals for dispersal. Desert willow produces high volumes of wind dispersed seeds that will germinate in fresh, moist sediment deposits. Burrobrush is a shallow-rooted, short-lived shrub, which produces prolific wind or water dispersed seed. Associated shrubs include: Common name (scientific name), Lbs acre L-H, and Percent cover L-H catclaw acacia (*Acacia greggii*), 80 to 283, 1 to 20. fourwing saltbush (*Atriplex canescens*), 0 to 138, 0 to 4. burrobrush (*Hymenoclea salsola*), 10 to 42, 1 to 3. desert almond (*Prunus fasciculata*), 0 to 80, 0 to 8. jojoba (*Simmondsia chinensis*), 0 to 20, 0 to 2. desert willow (*Chilopsis linearis*), 0 to 25, 0 to 1. Sweetbush (*Bebbia juncea*), 0 to 10, 0 to 1. Annual forb cover is sporadic, and related to seasonal and temporal precipitation, but may include: Common name (scientific name), Lbs acre L-H, and Percent cover L-H bristly fiddleneck (*Amsinckia tessellata*), 0 to 30, 0 to 2. pincushion flower (*Chaenactis fremontii*), 0 to 10, 0 to 1. sowthistle desertdandelion (*Malacothrix sonchoides*), trace smooth desertdandelion (*Malacothrix glabrata*), trace chia (*Salvia columbariae*), trace Non-native annual grasses: red brome (*Bromus rubens*), 0 to 20, 0 to 1. Mediterranean grass (Schismus spp.), 0 to 10, 0 to 2. Cheatgrass (*Bromus tectorum*), trace Non-native forbs: redstem stork's bill (*Erodium cicutarium*), trace Total annual production ranges from 120 to 650 lbs per acre, with an RV of 450 lbs/acre. Community Component 3 (CC3) Low relief bars This community is present on broad low relief sediment bars. It is adjacent to the active channel margins or in lower areas where sheet flow spreads across the site. It has less water availability than the active channel. This area floods occasionally, providing surface disturbance to favor the establishment of shorter-lived species such as burrobrush, sweetbush, desert senna, and Mojave rabbitbrush. Associated shrub species include: Common name (scientific name), Lbs acre L-H, and Percent cover L-H burrobrush (*Hymenoclea salsola*), 0 to 113, 0 to 15. catclaw acacia (*Acacia greggii*), 0 to 60, 0 to 3. sweetbush (*Bebbia juncea*), 0 to 25, 0 to 3 desert senna (*Senna armata*), 0 to 23, 0 to 2. Schott’s dalea (*Psorothamnus schottii*), 0 to 21, 0 to 6. Mojave rabbitbrush (*Ericameria paniculata*), 0 to 10, 0 to 1. creosote bush (*Larrea tridentata*), 0 to 10, 0 to 1. white ratany (*Krameria grayi*i), 0 to 4, 0 to 1. bladderpod spineflower (*Cleome isomeris*), 0 to 5, 0 to 1. Annual forb cover is sporadic, and related to seasonal and temporal precipitation. Annual and perennial forbs may include: Common name (scientific name), Lbs acre L-H, and Percent cover L-H bristly fiddleneck (*Amsinckia tessellata*), 0 to 40, 0 to 1. chia (*Salvia columbariae*), 0 to 6, 0 to 1. distant phacelia (*Phacelia distans*), 0 to 40, 0 to 1. curvenut combseed (*Pectocarya recurvata*), 0 to 26, 0 to 1. smooth desert dandelion (*Malacothrix glabrata*), 0 to 36, 0 to 11. sowthistle desertdandelion (*Malacothrix sonchoides*), 0 to 1, 0 to 1. desert trumpet (*Eriogonum inflatum*), trace. Non-native annual grasses Common name (scientific name), Lbs acre L-H, and Percent cover L-H red brome (*Bromus rubens*), 0 to 1, 0 to 1 Mediterranean grass (Schismus spp.), 0 to 2, 0 to 2 Non-native forbs: Common name (scientific name), Lbs acre L-H, and Percent cover L-H redstem stork's bill (*Erodium cicutarium*), trace. Total production is about 125 to 300 lbs/acre, with an RV of 150 Lbs acre. Community Component 4, higher relief gravel bars. This community is present on sediment bars with higher relief than the main channel. These areas are only flooded during large flood events, or when the main channel alters course. This community is dominated by creosote bush. Data was not collected on this community, but observations note creosote bush is dominant with catclaw acacia, white ratany, Eastern Mojave buckwheat (*Eriogonum fasciculatum*), and burrobush (*Ambrosia dumosa*). These areas can remain stable for long periods of time, and may resemble the vegetation on the adjacent stable alluvial fans, which vary by temperature and elevation along the drainage. After, a low energy flood, burrobrush may increase.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	140	275	499
Forb	–	28	224
Grass/Grasslike	–	1	6
Total	**140**	**304**	**729**

Community 2.2
Drought Response

This community phase develops in response to greater than 5 years of drought with an absence of flood events. The plant community components remain the same, as described in Community Phase 2.1, but the proportion of each community type shifts in response to drier conditions. CC1 declines in the absence of scouring, and CC3 begins to occupy these surfaces. CC2 begins to decline with mortality in response to drought. Catclaw acacia seeds germinate with warmer temperatures in August and September after greater than one inch of precipitation (Gucker 2005), or after summer flood events. So, over time catclaw acacia will decline due to lack of regeneration. Desert willow fruit production may be inhibited in response to drought (DePree and Ludwig 1978, Petersen et al. 1982). Further, moderate flooding in wet years is necessary for desert willow establishment (seeds dispersed in fall and winter establish in freshly deposited sediment), and establishment may be sporadic (Uchytil 1990, Sawyer et al. 2009). Since burrobush can take advantage of any moisture (i.e. not necessarily surface flow), CC3 increases, and occupies the channel margin and main channel. CC4 may slowly increase, as long-lived drought tolerant shrubs move into previously more flood prone positions. With prolonged periods without large flood events, perhaps greater than 100 years, CC3 may decline because the short-lived burrobush dies out in the absence of soil disturbance.

CC4 may increase and occupy positions previously occupied by CC3 and CC2. Community components: CC1 Barren gravels, active channel - declines, CC3 colonizes barren surfaces. CC2 Active channel margins – declines due to water stress. CC3 Burrobrush-catclaw acacia – moves into main channel. CC4 Creosote bush- burrobrush with mixed shrubs - increases, encroaches on CC3 on lower bar positions.

Community 2.3
Post-fire Regeneration

This community phase results from fire, which is historically rare in desert ephemeral drainageway communities. An increase in the abundance of invasive annual grasses and annual forb cover in associated upland communities has led to an increase in fire frequency (Brown and Minnich 1986, Brooks et al. 2004, Brooks and Matchett 2006, Rao et al. 2010, Steers and Allen 2011) upland communities as well as ephemeral drainageways. If extreme precipitation events follow fire, and especially if upslope hill communities also burned, then this community phase is vulnerable to channel entrenchment and transition to State 3, altered hydrology. This is because upslope and riparian vegetation act to reduce runoff and slow water flow, thus protecting soils from erosion and maintaining a system of braided channeling and sheet flow that supports the full range of vegetation communities in the ephemeral stream complex (Bull 1997). CC6 Catclaw acacia- mixed shrub regeneration This community represents the burned condition of CC2, and occupies active channel margins. Data is needed for this community type. Both catclaw acacia and desert willow will sprout from crowns after fire, with most individuals sprouting within several months of burning (Worthington and Corral 1986, Uchytil 1990, Gucker 2005, Sawyer et al. 2009). Catclaw acacia produces an abundant seedbank that can respond to precipitation after fire (Gucker 2005). CC7 Catclaw acacia - burrobrush regeneration This community represents the burned condition of CC3, and occupies low relief depositional bars. It may spread to active stream margins depending on climatic conditions. Both catclaw acacia and burrobrush respond well to fire. Catclaw acacia will resprout and has a persistent seed bank, while burrobrush resprouts and will quickly colonize disturbed areas from seed. Catclaw acacia dominates the community. Non-native annual grasses may also be quick to colonize this site after fire. This increase in fine fuel loads increases the susceptibility of the site to repeat burning (Brooks et al. 2004, Steers and Allen 2011). CC8 Burrobrush - mixed shrubs regeneration This community type represents the burned condition of CC4. Data is needed for this community type. Following low intensity fires, creosote bush may resprout, but more often does not, and creosote bush recruitment is slow (Brown and Minnich 1986, Marshall 1995). Burrobrush, which can quickly colonize disturbed areas from off-site seed sources, dominates the community. Other shrubs capable of resprouting after fire will increase in abundance, including peachthorn (*Lycium cooperi*), desert almond (*Prunus fasciculata*), and fourwing saltbush (*Atriplex canescens*). Post fire regeneration community components CC1. Barren gravels. CC6. Regeneration of CC2, catclaw acacia and desert willow. CC7. Regeneration of CC3, catclaw acacia and burrobrush CC8. Regeneration of CC4, burrobrush, mixed shrubs.

Pathway 2.1a
Community 2.1 to 2.2

This pathway occurs in response to drought.

Pathway 2.1b
Community 2.1 to 2.3

This pathway occurs in response to fire.

Pathway 2.2a
Community 2.2 to 2.1

This pathway occurs in response to average to above average precipitation and associated flood events.

Pathway 2.2b
Community 2.2 to 2.3

This pathway occurs in response to fire.

Pathway 2.3a

Community 2.3 to 2.1

This pathway occurs in response to the passing of time with average to above average precipitation and associated flood events.

Pathway 2.3b
Community 2.3 to 2.2

This pathway occurs in response to the passing of time with drought conditions and absence of flooding.

State 3
Hydrologically altered

State 3 represents altered hydrological conditions, from surface flow alterations or ground water depletion. Data is needed to develop a successional diagram for this state.

Community 3.1
Hydrologically Altered

Channel entrenchment can develop due to a range of interacting factors (Bull 1997), including the creation of drainage ditches in urban areas (NRCS staff observations), increased runoff and infiltration in downstream reaches due to an increase in impervious surfaces with urbanization (Nishikawa et al. 2004). Incised arroyos may form due to extreme climatic events, especially if they follow a period of drought or a fire that also burns upslope hill communities (Bull 1997). Data is needed for this process, which is thought to occur in CA698. Research in other arid lands ephemeral stream systems has shown that channel entrenchment can lead to mortality in xeroriparian communities in a time span of only decades (Bull 1997 and references therein). Observations in urban areas in the communities of Yucca Valley and Joshua Tree indicate that this is also the case here: several of the associated communities in the reference state of the ecological site are lost, and only a productive creosote bush community is left. In an in-depth study addressing management of groundwater resources in the Joshua Tree-Twentynine Palms area, Nishikwawa et al (2004) found that significant draw-down of upper and middle aquifers is occurring due to household wells, and that natural regeneration of aquifers is very limited. Desert willow is a phreatophyte that relies on groundwater to survive adverse droughty conditions (de Soyza et al. 2004). With severe ground-water depletion, existing desert willow trees will no longer be able to access water and will die. Data on the timeframe within which this might occur is not available. We do not have data for this community phase, though the above indicates that CC2 would die out, leaving CC3 through CC5. Catclaw acacia does not depend on groundwater for survival, although it does need regular flooding (or run-on on stony slopes). Landform alterations or road development can divert water away from washes. Xeroriparian communities would die out, and a succession from pioneer to upland communities would occur. Data is not available for this process, and we do not know whether it has occurred within the geographic scope of this ecological site.

Transition T1a
State 1 to 2

This transition is triggered by the introduction and establishement of non-native species. It is generally irreversable.

Transition T2a
State 2 to 3

Triggers that can cause a transition to State 3 include ground water depletion, surface flow alterations, and prolonged drought. Any of the community phases from this state can cross the threshold to State 3, but community phase 2.3 and the later stages of 2.2 are especially vulnerable because decreases in xeroriparian vegetation density (and upland vegetation density) leave soils more susceptible to erosion (Bull 1997).

Restoration pathway R3a
State 3 to 2

Restoration strategies of State 3 would need to be assessed for individual sites. Ground water depletion is a community-wide water management concern. Roads can be improved to eliminate diversion of surface flow.

Pervious surfaces could be used in place of impervious surfaces if possible.

Additional community tables

Table 6. Community 2.1 plant community composition

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

Table 7. Community 2.2 plant community composition

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

Animal community

Small animals live in this ecological site. Animal diversity in this ecological site may be greater than in other areas due to the heterogeneity of the site. Large shrubs and trees, such as catclaw acacia (*Acacia greggii*), desert almond (*Prunus fasciculata*), and desert willow (*Chilopsis linearis*), provide structural diversity and additional food sources that may support a higher diversity of fauna. Ephemeral drainages are important wildlife migration corridors.

Hydrological functions

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

Recreational uses

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

Other products

Catclaw acacia wood is strong, durable and has unique coloration. It has been used to make cabinets, souvenirs, and fencing (Uchytil 1990).

Native Americans used desert willow wood to make bows and baskets (Gucker 2005).

Other information

Catclaw acacia seeds are edible, but were not eaten by Native Americans until other food sources were scarce. Catclaw acacia may have several medicinal uses. Native Americans used the wood for fuel (Gucker 2005).

Inventory data references

The following NRCS vegetation plots were used to describe this ecological site:

Community Phase 2
CC2
POWA81, Cajon
ACGR-PT1 (vegetation only)
ACGR-PT2 (vegetation only)
PF960-drain, Arizo (upper elevation, cover only)

CC3
1249712134, Arizo ESD type location
1249704015, Arizo

1249704014, Arizo

CC4
no data, Field notes near 1249712134

Type locality

Location 1: San Bernardino County, CA	
UTM zone	N
UTM northing	584717
UTM easting	3776597
General legal description	The type location is north of Joshua Tree National Park and south of Twentynine Palms.

Other references

Brooks, M. L., C. M. D'Antonio, D. M. Richardson, J. B. Grace, J. E. Keeley, J. M. DiTomaso, R. J. Hobbs, M. Pellant, and D. Pyke. 2004. Effects of invasive alien plants on fire regimes. Bioscience 54:677-689.

Brooks, M. L. and J. R. Matchett. 2006. Spatial and temporal patterns of wildfires in the Mojave Desert, 1980-2004. Journal of Arid Environments 67:148-164.

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.
de Soyza, A. G., K. T. Killingbeck, and W. G. Whitford. 2004. Plant water relations and photosynthesis during and after drought in a Chihuahuan desert arroyo. Journal of Arid Environments 59:27-39.

DePree, E. and J. A. Ludwig. 1978. Vegetative and Reproductive Growth Patterns in Desert Willow (*Chilopsis linearis* (Cav.). The Southwestern Naturalist 23:239-245.

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

Griffeths, P. G., R. Hereford, and R. H. Webb. 2006. Sediment yield and runoff frequency of small drainage basins in the Mojave Desert, U.S.A. Geomorphology 74:232-244.

Gucker, C. L. 2005. *Acacia greggii*. In: Fire Effects Information System U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory.

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.

Marshall, K. A. 1995. *Larrea tridentata*. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory.

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.

Petersen, C., J. H. Brown, and A. Kodric-Brown. 1982. An experimental study of floral display and fruit set in *Chilopsis linearis* (Bignoniaceae). Oecologia 55:7-11.

Rao, L. E., E. B. Allen, and T. M. Meixner. 2010. Risk-based determination of critical nitrogen deposition loads for fire spread in southern California deserts. Ecological Applications 20:1320-1335.

Sawyer, J. O., T. Keeler-Woolf, and J. M. Evans. 2009. A manual of California vegetation. 2nd edition. California Native Plant Society, Sacramento, California.

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.

Uchytil, R. J. 1990. *Chilopsis linearis*. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory

Worthington, R. D. and R. D. Corral. 1986. Some effects of fire on shrubs and succulents in a Chihuahuan Desert community in the Franklin Mountains, El Paso County, Texas. Second Symposium on Resources of the Chihuahuan Desert. Chihuahuan Desert Research Institute, Texas.

Approval

Marji Patz, 3/11/2025

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)	Dustin Detweiler
Contact for lead author	Dustin Detweiler
Date	11/03/2014
Approved by	Marji Patz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Many rills may be present with less than 10 feet apart, especially after intense storm events during exceptionally dry periods. Within this ephemeral stream system rills gently merge in and out of water flow patterns.

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2. **Presence of water flow patterns:** Yes, this is an ephemeral stream system. Water flow patterns are extensive throughout this site except on alluvial terraces, bars, or stream terraces. These landforms may have some water flow patterns from intense storms but will not have extensive water flow patterns like the main river wash areas. A great amount of spatial and temporal variability of water flow patterns within ephemeral stream systems should be expected.

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3. **Number and height of erosional pedestals or terracettes:** Rarely any terracettes at this site but few debris dams may

be present among plants within the ephemeral stream. Some plants may be pedestalled, especially after flash flooding events. The number of debris dams and pedestalled plants within desert washes are often a reflection of the rangeland health of the upland portions of the ephemeral streams watershed. Removal of plants by drought, fire, land clearing (such as roads), and/or heavy grazing in the surrounding uplands will amplify flash flooding effects.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is greater than 20%.

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5. **Number of gullies and erosion associated with gullies:** This is an ephemeral stream which is sometimes synonymous with a gully yet this ecological site rarely produces steep cut banks into the surrounding fans.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** There are no blowouts but many areas of this ESD are washed out. Many flooding borne depositional areas exist throughout this site from fine silt to gravels and cobbles.

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement is extensive with medium woody material moving great distances in the most active portions of the ephemeral stream system.

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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):** Most of the wash is 0 to 1 single grain structure with some cementation. Some areas under shrubs can have a stability value up to 3.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure can be structureless single grain structure, weak thin platy structure, weak fine subangular blocky structure, or moderate thin platy structure. A horizons are usually light brownish colors and up to 6 inches thick.
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plants are widely spaced perennial shrubs. Annual plant growth is limited to bars protected from frequent flooding events. Gravels, cobbles and loose sand probably influence infiltration more than the sparse perennial plant composition. In portions of the ephemeral stream where removal processes are greater than depositional processes, then cemented layers maybe exposed at the surface. Cemented layers will reduce infiltration. Runoff is generally downstream and can contribute to channel migration processes.

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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):** None. Platy or massive sub-surface horizons, not to be interpreted as compacted layers.

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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: Mojave Desert shrubs (Catclaw acacia >> burrobrush)

Sub-dominant: Annual forbs

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Plant mortality is random and based on which plants have been uprooted during a flash flood. Catclaw acacia is the first to exhibit decadence and mortality during extended drought years.

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14. **Average percent litter cover (%) and depth (in):** Litter cover may increase as time since last precipitation event increases. Flash flooding moves much of the litter either further downstream or under shrubs. Litter cover is usually individual pieces of plant debris rather than an accumulated layer of litter.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season aproximately 275 lbs/ac. Favorable years 650 lbs/ac and unfavorable years 125 lbs/ac.

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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:** Potential invaders on this site include cheatgrass, red brome, Mediterranean grass, and redstem filaree. Red brome is likely the only species with the potential to become a co-dominant species by annual production at this site.

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17. **Perennial plant reproductive capability:** All functional groups should reproduce in average and above-average growing season years. Little reproduction occurs in drought years. Even during low intensity drought years, ephemeral streams may have a higher reproductive capability than the surrounding upland landforms because water from precipitation events is concentrated into these areas.
