Ecological site R030XB167CA
Large, Sandy, Thermic, 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 LRU's or are atypical compared to the surrounding landscape. Common overriding XY characteristics within this MLRA include: ephemeral streams subject to flash flood events, riparian areas or other water features, and soils with strong chemical influence (Na, Ca, etc).

Ecological site concept

This ecological site occurs on relatively large, third order or greater drainageways. The composition and successional dynamics of this ecological site is determined by flash flood events. Catchment size may range from 5,000 to greater than 56,000 acres. Elevations range from 2,100 to 5,120 feet, and slopes of 2 to 4 percent are typical. This ecological site is associated with very deep, somewhat excessively drained soils that have sandy textures throughout, and thermic soil temperature regimes. This site often begins at slope break between steeper mountains and aggrading alluvial fans, or where two second order streams merge. These drainages provide a relatively consistent deep-water source, which supports desert willow communities. Flood intensity, scour and sediment transport varies across the drainageway and along the channel segments, which create a complex of plant communities.

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 R030XY167CA.

Associated sites

R030XB168CA	**Cool Deep Sandy Fans** This ecological site is on adjacent alluvial fans, at higher elevations, and is dominated by California juniper and blackbrush.
R030XB173CA	**Coarse Loamy Very Deep Fan Remnants** This ecological site is on alluvial fans, with a thin eolian sand surface with blackbrush, creosote bush, and fair cover of big galleta.
R030XB171CA	**Dissected Pediment** This ecological site is found on pediments, with burrobrush (Ambrosia dumosa), creosote bush (Larrea tridentata) and blackbrush.
R030XB174CA	**Sandy Fan Aprons** This site in on alluvial fans with and Creosote bush and Joshua tree.
R030XB183CA	**Loamy Very Deep Fan Remnants** This site is on alluvial fans with blackbrush and creosote bush dominant.
R030XB005NV	**Arid Active Alluvial Fans** This site is on the adjacent alluvial fans at the lower elevations of this site, and is dominated by creosote bush and burrobrush.
R030XB166CA	**Dissected Pediment, Cool** This site is found on pediments and the dominant species are blackbrush (Coleogyne ramosissima) and California juniper (Juniperus californica).

Similar sites

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

Table 1. Dominant plant species

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

Physiographic features

This ecological site occurs on drainageways, channels, stream terraces, lower fan aprons and inset fans. It occurs at elevations of 2,100 to 5,120 feet and has slopes ranging from 2 to 8 percent, but slopes of 2 to 4 percent are typical. A frequent flooding regime is necessary to maintain the reference condition for the site, but flooding frequency reaching different landform positions or different longitudinal sections within the site may also be very rare, rare or occasional. Flooding duration is extremely brief to very brief, and runoff is very low to low.

Table 2. Representative physiographic features

Landforms	(1) Channel (2) Drainageway (3) Inset fan
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	Very rare to frequent
Elevation	2,100–5,120 ft
Slope	2–8%
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 75 to 175 millimeters (3 to 7 inches); mean annual air temperature is 13 to 20 degrees C. (55 to 68 degrees F.), and the frost-free season is 210 to 320 days.

Table 3. Representative climatic features

Frost-free period (average)	320 days
Freeze-free period (average)	
Precipitation total (average)	7 in

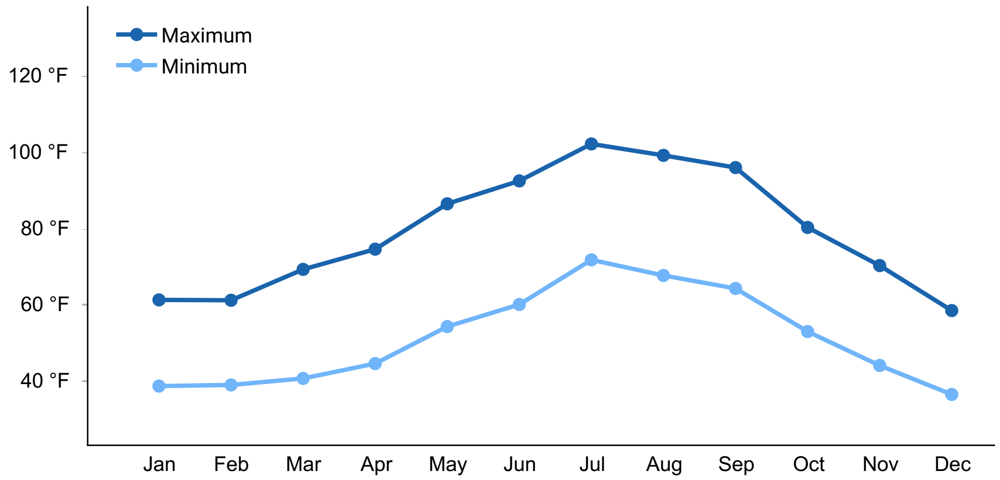

Figure 1. Monthly average minimum and maximum temperature

Influencing water features

This ecological site is associated with moderate to large-sized ephemeral stream systems which are subject to frequent and large flash-flood events.

Soil features

This ecological site is found on alluvial soils derived primarily from granitioid sources. Soils are very deep and have sand or loamy sand surface textures. Subsurface textures are sand, loamy sand or loamy coarse sand. For rock fragments less than 3 inches in diameter, the percent surface cover ranges from 40 to 70 percent, and subsurface volume ranges from 2 to 25 percent. For rock fragments greater than 3 inches in diameter, the percent surface cover ranges from 0 to 5 percent. Larger fragments are generally absent in the subsurface. Soils are somewhat excessively drained, and permeability is moderate to rapid. Available water capacity ranges from 1.5 to 3.1 inches per 40 inches of soil.

This ecological site is associated with the following soil series: Morongo (Mixed, thermic Typic Torripsamments).

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

Map unit ID; Map unit name; Component; phase; Percent (Multiple components within a mapunit are listed below the mapunit ID and map unit name)
3676; Morongo loamy sand, 2 to 8 percent slopes;Morongo;frequently flooded; 4
3680; Morongo loamy sand, 2 to 8 percent slopes, dry; Morongo; frequently flooded; 2
3683 ;Morongo-Bluecut association, 2 to 8 percent slopes; Morongo; occasionally flooded; and Morongo; frequently flooded; 2
3690; Nasagold gravelly loamy sand, 2 to 4 percent slopes; Morongo; frequently flooded; 1
4245; Bluecut-Morongo-Yander association, 2 to 8 percent slopes; Morongo;frequently

flooded; 2
4450; Morongo association, 2 to 4 percent slopes; Morongo; very rarely flooded; 3 and Morongo; rarely flooded; 5 and Morongo; occasionally flooded; 75, and Morongo; frequently flooded; 15
4615; Desertqueen-Jumborox-Rock outcrop association, 2 to 15 percent slopes; Morongo; occasionally flooded; 5
4805; Rock outcrop-Ironped association, 8 to 15 percent slopes; Morongo;frequently flooded; 3

Table 4. Representative soil features

Parent material	(1) Alluvium–granite
Surface texture	(1) Sand (2) Loamy sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained
Permeability class	Moderate to rapid
Soil depth	60 in
Surface fragment cover <=3"	40–70%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	1.5–3.1 in
Calcium carbonate equivalent (0-40in)	0–1%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	5.6–8.2
Subsurface fragment volume <=3" (Depth not specified)	2–25%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This ecological site occurs on relatively large, third order or greater drainageways. Catchment size may range from 5,000 to greater than 56,000 acres. Elevations range from 2,100 to 5,118 feet, and slopes of 2 to 4 percent are typical. This ecological site is associated with very deep, somewhat excessively drained soils that have sandy textures throughout, and thermic soil temperature regimes. This site often begins at slope break between steeper mountains and aggrading alluvial fans, or where two second order streams merge. These drainages provide a relatively consistent deep-water source, which supports desert willow communities.

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).

Flood intensity, scour and sediment transport varies across the drainageway and channel segments, which creates a complex of plant communities. The drought-tolerant vegetation that exists on ephemeral streams and drainageways is referred to as xeroriparian vegetation. It is distinct from the surrounding landforms due to a difference in species composition, size, and production (Johnson et al. 1984, Levick et al. 2008). Xeroriparian vegetation is present because the increased availability of water and flood disturbances in these drainageways. Desert willow and catclaw acacia are present along active channel margins. These species have been termed phreatophytes since they have deep roots, and primarily rely on a deep water source. A deep water source refers to a water table or a zone of saturated soils. However, these ephemeral streams do not generally have water tables within reach of plant roots, what the plants are accessing in this case is referred to as deep ground water (Nilsen et al. 1984). Catclaw acacia, desert willow and pioneer shrubs are present on areas subject to frequent and occasional flooding and pioneer and upland shrubs are present on rarely to very rarely flooded areas. Collectively, all these plant communities are part of the xeroriparian vegetation and provide xeroriparian habitat.

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 fan piedmonts is an ongoing and a long-term process in the development of alluvial fans and associated landforms, 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 generally occurs on the middle to lower section of a fan apron, or in broad valley bottoms, at the low point between the opposing fan aprons. At the distal reaches of the fan aprons surface flow dissipates and 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.

These plant communities occur on microfeatures within the drainageway that are related to flooding frequency and intensity, but are also influenced by other disturbances such as fire and drought.

A properly functioning ephemeral drainage will provide some similar hydrologic functions as perennial streams. Ephemeral streams maintain water quality by allowing energy dissipation during high water flow. They transport nutrients and sediments, store sediments and nutrients in deposition zones, provide temporary storage of surface water, and longer duration storage of subsurface water. The structure and forage provided by 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 hydrology of the 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 phreotophytes, such as desert willow and catclaw acacia, potentially eliminating this species from certain areas.

State and transition model

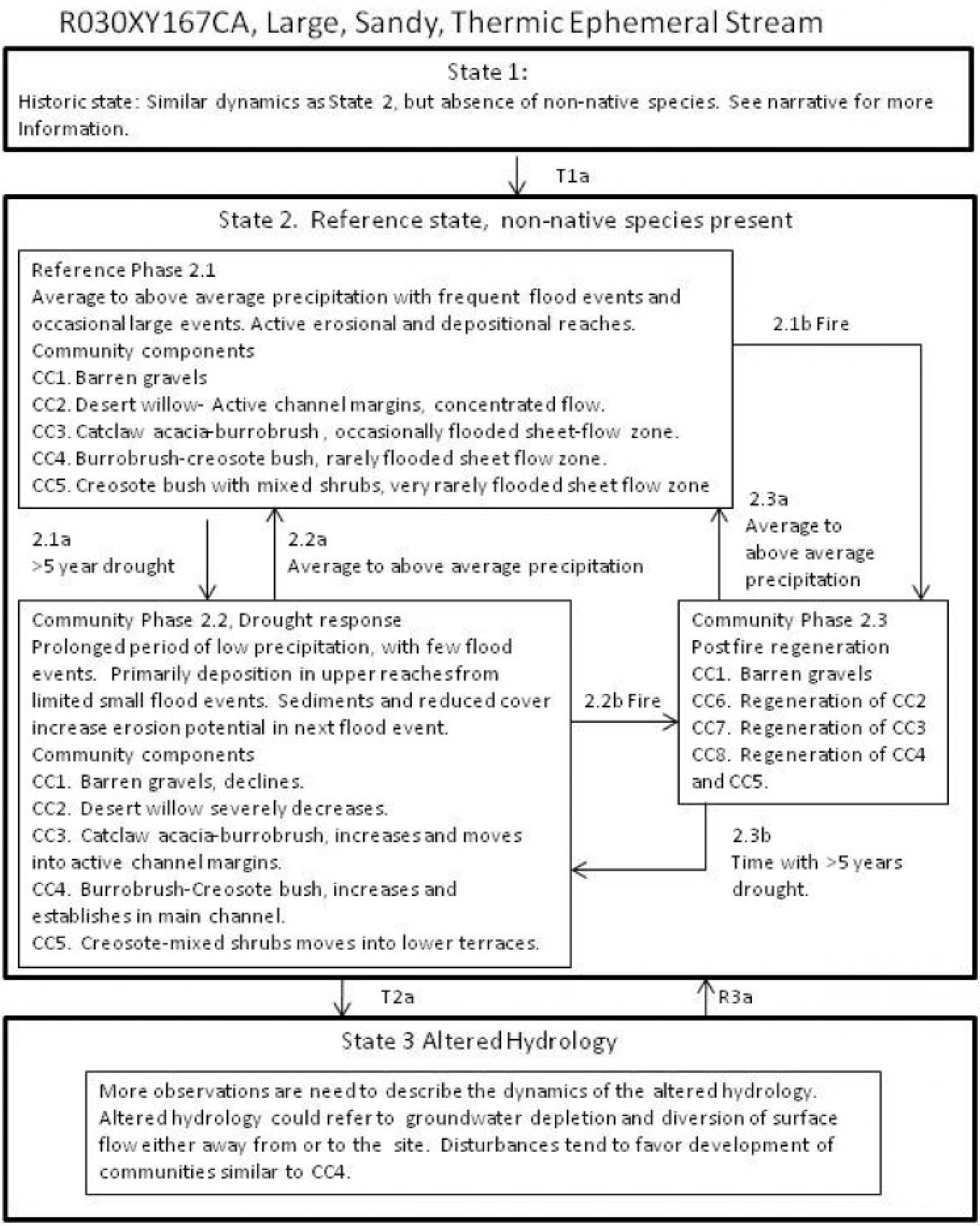

Figure 2. R030XY167CA Model

State 1
Historic State

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

State 2
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 3. Community Component 2

Figure 4. Community Component 3

Figure 5. Community Component 4

Figure 6. Community Component 5

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 creates 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. There are five dominant, predictable community components within this phase (although other permutations may exist). Community Component 1 (CC1) This community develops with frequent flooding of regular intensity, and consistent larger floods within 10-20 year time periods. Barren gravels occupy most of the active channel. These areas receive high intensity scouring where plant establishment is limited. Community Component 2 (CC2) A xeroriparian tree community dominated by desert willow (*Chilopsis linearis*), or a mix of desert willow and catclaw acacia (*Acacia greggii*) occupies active channel margins where flooding is frequent (regular flooding event every 10-20 years). Desert willow is a long-lived (>100 years), winter deciduous phreatophyte. It reproduces sexually by wind-dispersed seed, as well as asexually by crown-sprouting following mechanical disturbance (Uchytil 1990). Seedlings establish in freshly deposited sediment, and require moisture for establishment (Uchytil 1990). Seeds are dispersed in the fall and winter and probably do not remain viable beyond the spring after dispersal (Magill 1974). Fruit production may be inhibited during drought (DePree and Ludwig 1978, Petersen et al. 1982). Desert willow may colonize freshly deposited sediment, and then act to trap further sediments, thereby creating islands within the active channel (Gardner 1951), and it also acts to stabilize stream banks (Uchytil 1990). Stands of desert willow are often absent from apparently suitable washes, indicating that this community can come and go (Sawyer et al. 2009). Associated shrubs include: Common name (scientific name), Lbs acre L-H, and Percent cover L-H desert willow (*Chilopsis linearis*), 50 to 1110, 9 to 44. catclaw acacia (*Acacia greggii*), 50 to 88, 1 to 5. burrobrush (*Hymenoclea salsola*), 5 to 20, 0 to 2. desert almond (*Prunus fasciculata*), 0 to 46, 0 to 8. bladderpod spineflower (*Cleome isomeris*), 0 to 22, 0 to 2. desert senna (*Senna armata*), 0 to 15, 0 to 1. Mojave indigobush (*Psorothamnus arborescens*), 0 to 12, 0 to 5. fourwing saltbush (*Atriplex canescens*), 0 to 9, 0 to 4. peach thorn (*Lycium cooperi*), 0 to 10, 0 to 4. Encelia (Encelia), 0 to 88, 0 to 2. Perennial forbs: Common name (scientific name), Lbs acre L-H, and Percent cover L-H Thurber's sandpaper plant (*Petalonyx thurberi*), 0 to 35, 0 to 3. woolly bluestar (*Amsonia tomentosa*), 0 to 3, 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*), 40 to 100, 0 to 2. pincushion flower (*Chaenactis fremontii*), 0 to 90, 0 to 2. lacy phacelia (*Phacelia tanacetifolia*), 0 to 90, 0 to 1. blazing star (Menztelia sp.), trace sowthistle desertdandelion (*Malacothrix sonchoides*), trace smooth desertdandelion (*Malacothrix glabrata*), trace woolly easterbonnets (*Antheropeas wallacei*), trace cryptantha (Cryptantha sp.), trace Non-native annual grasses: red brome (*Bromus rubens*), 0 to 8, 0 to 1. Mediterranean grass (Schismus spp.), 0 to 2, 0 to 6. Non-native forbs: redstem stork's bill (*Erodium cicutarium*), 0 to 20, 0 to 1. Total annual production ranges from 1100 to 1793 lbs per acre, with an RV of 1400 lbs/acre. Community Component 3 (CC3) The catclaw acacia-burrobush community is found in portions of the drainageway with less frequent or less intense flooding, such as stream terraces or less confined sections of the drainage. In these areas, larger floods diverge as sheet flow or into braided channels. The vegetation is dominated by catclaw acacia and burrobrush. Catclaw acacia is not restricted to drainageways, but usually reaches dominance only where there is regular flooding, or on upland areas where surface rocks channel water (Sawyer et al. 2009). Seeds of catclaw acacia require scarification for germination, so depend on flooding events for stand maintenance and site colonization. Burrobrush is a pioneer species that can quickly colonize disturbed areas, and may establish in a wide range of riparian and upland sites (Sawyer et al. 2009). Catclaw acacia dominates the shrub layer at approximately 10% cover (30 to 40% relative canopy cover). Common shrubs include: Common name (scientific name), Lbs acre L-H, and Percent cover L-H Catclaw acacia (*Acacia greggii*), 198 to 280, 10 to 23. burrobrush (*Hymenoclea salsola*), 32 to 41, 1 to 5. fourwing saltbush (*Atriplex canescens*), 0 to 138, 0 to 4. desert almond (*Prunus fasciculata*), 0 to 80, 0 to 8. Nevada jointfir (*Ephedra nevadensis*), 0 to 15, 0 to 3. Joshua tree (*Yucca brevifolia*), 0 to 5, 0 to 1. peachthorn (*Lycium cooperi*), 0 to 5, 0 to 1. desert willow (*Chilopsis linearis*), 0 to 3, 0 to 5. 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*), 30 to 180, 1 to 2. pincushion flower (*Chaenactis fremontii*), 0 to 10, 0 to 1. lacy phacelia (*Phacelia tanacetifolia*), 0 to 90, 0 to 1. scented cryptantha (*Cryptantha utahensis*), 0 to 1, 0 to 1. miniature woollystar (*Eriastrum diffusum*), 0 to 1, 0 to 1. desert trumpet (*Eriogonum inflatum*), 0 to 1, 0 to 1. birdcage evening primrose (Oenothera deltoids), 0 to 2, 0 to 1. sand fringepod (*Thysanocarpus curvipes*), 0 to 10, 0 to 2. woolly easterbonnets (*Antheropeas wallacei*), trace sowthistle desertdandelion (*Malacothrix sonchoides*), trace Non-native annual grasses include: Common name (scientific name), Lbs acre L-H, and Percent cover L-H red brome (*Bromus rubens*), 20 to 30, 1 to 5. Non-native forbs: Common name (scientific name), Lbs acre L-H, and Percent cover L-H redstem stork's bill (*Erodium cicutarium*), 0 to 20, 0 to 2. Total annual production ranges from 280 to 700 lbs per acre, with an RV of 480. Community Component 4 (CC4) The burrobush-creosote bush community is found slightly higher above, or further from, the main channel than CC3, where water velocity and depth has dissipated. It is found on inset fans and stream terraces. This community is maintained by moderate flooding events powerful enough to prevent dominance of long-lived upland shrubs like creosote bush, but not frequent enough to provide infiltration necessary to support phreatophytes like desert willow or catclaw acacia. Burrobrush is tolerant of disturbance and is not limited to a particular flooding regime. Upland species such as creosote bush become more important in this community, and a mix of disturbance adapted shrub species is present. Burrobush is dominant, at about 10% cover. 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 300 to 350 lbs/acre, with an RV of 320 lbs acre. Community Component 5 (CC5) The creosote bush-burrobush mixed shrub community is found on low input stream terraces, inset fans, and fan aprons. This community becomes dominant where water flow dissipates or very rarely or rarely floods. Low-level sheet flow supports large, productive creosote bush, which dominates at approximately 5-10% canopy cover. Burrobush is often still an important plant species in this community, but is less important than creosote bush. A diverse mix of associated shrub species is present, including: Common name (scientific name), Lbs acre L-H, and Percent cover L-H creosote bush (Larrea tridentate), 96 to 250, 5 to 10. burrobush (*Ambrosia dumosa*), 0 to 1, trace. burrobrush (Hymenclea salsola), 15 to 30, 3 to 6. peach thorn (*Lycium cooperi*),0 to 34, 0 to 4. Thurber's sandpaper plant (*Petalonyx thurberi*), 0 to 26, 0 to 2. Mojave indigobush (*Psorothamnus arborescens*), 0 to 15, 0 to 2. Desertsenna (*Senna armata*), 0 to 18, 0 to 1. Other shrubs that may be present include catclaw acacia (*Acacia greggii*), Nevada jointfir (*Ephedra nevadensis*), Mojave buckwheat (Erioganum fasciculatum), waterjacket (*Lycium andersonii*), 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 Steve's dustymaiden (*Chaenactis stevioides*) 0 to 80, 0 to 3. cryptantha (Cryptantha spp.), 0 to 5, 0 to 5. smooth desertdandelion (*Malacothrix glabrata*), 0 to 2, 0 to 1. pincushion flower (*Chaenactis fremontii*), 0 to 1, 0 to 2. prickly lettuce (*Lactuca serriola*), trace. curvenut combseed (*Pectocarya recurvata*), trace. Bigelow's tickseed (*Coreopsis bigelovii*), trace. Mojave desertstar (Monptilon bellioides), trace. Purplemat (*Nama demissum*), trace. woolly easterbonnets (*Antheropeas wallacei*) , trace. Non-native grasses include: Common name (scientific name), Lbs acre L-H, and Percent cover L-H Mediterranean grass (Schismus spp.), trace. Non-native forbs include: Common name (scientific name), Lbs acre L-H, and Percent cover L-H redstem stork's bill (*Erodium cicutarium*), trace. Total annual production is about 300 lbs. per acre.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	150	600	1110
Shrub/Vine	88	240	450
Forb	40	150	200
Grass/Grasslike	0	10	33
Total	**278**	**1000**	**1793**

Community 2.2
Drought Response

This community phase develops after greater than 5 years of drought, and 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 CC4 begins to occupy these surfaces. CC2 begins to decline as new stands of desert willow are not initiated. 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). Desert willow seed has no dormancy, and seeds probably do not survive beyond the spring after dispersal occurs (Magill 1974). So although desert willow is long-lived (> 100 years), stands will not replace themselves in the absence of suitable recruitment conditions, and new stands of desert willow will not establish in suitable unoccupied locations. Since catclaw acacia produces a long-lived seed bank, and burrobush can take advantage of any moisture (i.e. not necessarily surface flow), CC3 increases, and occupies sites that may have been colonized by CC2. CC4 increases, moving into previously scoured areas. CC5 also increases, encroaching on positions occupied by CC4. With prolonged periods without large flood events, perhaps greater than 100 years, CC3, which is more resilient than CC2, may occupy positions previously occupied by CC2. Desert willow may become uncommon along the system. CC4 may decline because the short-lived burrobush dies out in the absence of flooding and lacks freshly disturbed surfaces to colonize. CC5 may increase and occupy positions previously occupied by CC4 and CC3. Community components: CC1 Barren gravels, active channel - declines, CC4 colonizes barren surfaces. CC2 Desert willow-Active channel margins - begins to decline with lack of desert willow recruitment. CC3 Catclaw acacia-burrobrush – becomes dominant on active channel margins. CC4 Burrobrush- creosote bush - increases, colonizes barren gravel surfaces, but will decline over longer period in the absence of flooding. CC5 Creosote bush- burrobrush with mixed shrubs - increases, encroaches on CC4 and onto lower terrace positions.

Community 2.3
Post fire Regeneration

Figure 8. Community Component 7

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) in 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 sheetflow that supports the full range of vegetation communities in the riparian complex (Bull 1997). CC6 Catclaw acacia-desert willow regeneration This community represents the burned condition of CC2, and occupies active channel margins. Data is needed for this community type. Both desert willow and catclaw acacia 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). However, if drought conditions follow fire, than new sprouts of desert willow, which is normally unpalatable and not browsed by wildlife, may be browsed heavily (Uchytil 1990). This will favor regeneration of catclaw acacia over desert willow. Further, catclaw acacia produces an abundant seedbank that can respond to precipitation after fire, while desert willow does not (Uchytil 1990, Gucker 2005). CC7 Catclaw acacia - burrobrush regeneration This community represents the burned condition of CC3, and occupies active and semi-active terraces. 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 also resprouts and will quickly colonize disturbed areas from seed. Catclaw acacia dominates the community. Non-native annual grasses are quick to colonize this site after fire. The brome grasses (*Bromus rubens* and *Bromus tectorum*) become especially abundant in burned areas on the western edge of the Mojave desert (where this ecological site is located) where nitrogen inputs from urban areas are highest (Rao et al. 2010 and references therein), and where precipitation is higher. This increase in fine fuel loads increases the susceptibility of the site to repeat burning (Brooks et al. 2004, Steers and Allen 2011). Associated shrubs include: Common name (scientific name), Lbs acre L-H, and Percent cover L-H catclaw acacia (*Acacia greggii*), 100 to 200, 5 to 10 burrobrush (Hymenclea salsola), 10 to 34, 1 to 5. Nevada jointfir (*Ephedra nevadensis*), 0 to 15, 0 to 3 California ephedra (*Ephedra californica*), 0 to 10, 0 to 1. peach thorn (*Lycium cooperi*). 0 to 213, 0 to 4. Schott's dalea (*Psorothamnus schottii*), 0 to 6, 0 to 1. Non-native annual grasses were quick to colonize this site after fire quick and include: Common name (scientific name), Lbs acre L-H, and Percent cover L-H red brome (*Bromus rubens*), 0 to 20, 0 to 5 Mediterranean grass (Schismus spp.) 0 to 10, 0 to 10. cheatgrass (*Bromus tectorum*), 0 to 4, 0 to 2. Forbs present in this community type include: Common name (scientific name), Lbs acre L-H, and Percent cover L-H bristly fiddleneck (*Amsinckia tessellata*), 0 to 180, 0 to 1. woolly easterbonnets (*Antheropeas wallacei*), 0 to 1, 0 to 1. scented cryptantha (*Cryptantha utahensis*), 0 to 1, 0 to 1. miniature woollystar (*Eriastrum diffusum*), 0 to 1, 0 to 1. desert trumpet (Erioganum inflatum), 0 to 1, 0 to 1. sowthistle dandelion (*Malacothrix sonchoides*), trace. California evening primrose (*Oenothera californica*), trace. Total annual production is about 600 lbs/ acre. CC8 Burrobrush - mixed shrubs regeneration This community type represents the burned condition of CC4 and CC5. 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 and CC5, burrobrush, mixed shrubs.

Pathway 2.1a
Community 2.1 to 2.2

This pathway occurs in response to greater than 5 years of drought, and an absence of flood events. The active, freshly scoured portion of the channel declines and a lack of freshly deposited sediment and moist conditions inhibits recruitment of desert willow.

Pathway 2.1b
Community 2.1 to 2.3

 

Reference Phase **Post fire Regeneration**

This pathway occurs in response to fire. Desert washes historically burn very infrequently (Uchytil 1990), but an increase in the abundance of invasive annual grasses and annual forb cover in general in associated upland communities (Brown and Minnich 1986, Brooks et al. 2004, Brooks and Matchett 2006, Rao et al. 2010, Steers and Allen 2011) has led to an increase in fire frequency in desert wash communities.

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

 

Post fire Regeneration **Reference Phase**

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 greater than 5 years of drought.

State 3
Altered Hydrology

State 3 represents altered hydrological conditions. Data is needed to develop a successional diagram for this state.

Community 3.1
Altered Hydrology

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). 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. 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

Transition to State 2 is based on the introduction of non-native species, mainly annual grasses. There may be only a trance amount of non-natives present.

Transition 2a
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 3a
State 3 to 2

Restoration methods to restore natural hydrology need to be assessed for individual stream sections. 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 (Lb/Acre)	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 desert willow (*Chilopsis linearis*), catclaw acacia (*Acacia greggii*), and desert almond (*Prunus fasciculata*), 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

Large drainageways in which this ecological site is provide open travel corridors for hiking trails.

Wood products

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

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

Other products

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:

State 2, Community Phase 2.1
CC2
1249800828- Modal Morongo FF, and ESD type location
CHLI-PT1 (Veg only, MU3680)
CHLI-PT2 (Veg only, MU3676)

CC3
ACGR-PT1 (Veg only, MU3680)
ACGR-PT2 (Veg only, MU3676)

CC4
1249704015

CC5
1249706106
1249706111

State 2, Community Phase 2.3
1249800827, modal for Morongo OF

The type locality is on private property, about a tenth of a mile north of Joshua Tree National Park in Quail Wash. The exact location will not show in this report due to private property rights.

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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	07/16/2025

Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

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

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

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

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

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

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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

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

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

---

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

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

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

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

17. **Perennial plant reproductive capability:**