USDA Natural Resources
Conservation Service

Ecological site R030XY188CA
Slightly Alkaline, Rarely To Occasionally Flooded 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.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

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 first and second order drainages. It is influenced by rare to occasional flash flood events, which disperse across the broad, unconfined, braided drainageways and inset fans that this ecological site

occurs on. Because of the diffusion of flow, flood intensity is low. Soils are very deep and sandy. Hall's shrubby spurge (Tetracoccus hallii) and creosote bush (Larrea tridentata) dominate but there is a complex of plant communities present depending upon flood disturbance. This site occurs near the boundary between the Mojave (Major land resource area 30, MLRA30) and Sonoran Deserts (MLRA31). It is considered part of MLRA30, but may receive a higher percentage of summer precipitation than is usual in this MLRA, which may benefit Hall's shrubby spurge. Elevations range from 2390 to 3440 feet, with slopes from 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.

Associated sites

R030XB005NV	**Arid Active Alluvial Fans** This ecological site is on adjacent fan aprons, which are not influenced by flooding. Creosote bush and burrobush dominate.
R030XB139CA	**Shallow Dry Hill 4-6 P.Z.** This ecological site is on sideslopes of fan remnants and has low cover of creosote bush.
R030XB218CA	**Moderately Deep To Very Deep Loamy Fan Remnants** This ecological site is on adjacent fan aprons which are often over fan remnants. Burrobush, Hall's shrubby spurge, and creosote bush dominate.

Similar sites

R030XY202CA	**Very Rarely To Rarely Flooded Thermic Ephemeral Stream** This very rarely to rarely flooded ephemeral stream is not associated with slightly alkaline soils, is at higher elevations, and is dominated by California ephedra.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Larrea tridentata* (2) *Tetracoccus hallii*
Herbaceous	(1) *Amsinckia tessellata* (2) *Salvia columbariae*

Physiographic features

This ecological site occurs on inset fans, drainageways. It occurs at elevations of 2,390 to 3,440 feet and slopes range from 2 to 8 percent.

Table 2. Representative physiographic features

Landforms	(1) Inset fan (2) Drainageway
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	728–1,049 m
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 101 to 178 millimeters (4 to 7 inches); mean annual air temperature is 17.2 to 20 degrees C. (63 to 68 degrees F.), and the frost-free season is 270 to 320 days. The freeze free period is 295 to 325 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)	320 days
Freeze-free period (average)	325 days
Precipitation total (average)	178 mm

Influencing water features

This ephemeral stream is associated with rare to occasional flash flood events.

Soil features

The soils associated with this ecological site are very deep and formed in alluvium from granitoid or igneous rocks. These soils are well drained to somewhat excessively drained. Surface textures are sand or gravelly loamy sand. The subsurface textures (from 1 to 59 inches) are commonly sandy and gravelly (15 to 35 percent rock fragments), with the exception of the Olympus soil which as a sandy clay loam texture starting at 37 inches. Surface cover of rock fragments less than 3 inches in size ranges from 65 to 75 percent and surface cover of rock fragments greater than 3 inches ranges from 0 to 5 percent. Subsurface rock fragments (1 to 61 inches) less than 3 inches range from 5 to 45 percent by volume, and fragments greater than 3 inches are generally absent.

The Cajon soils are: mixed, thermic Typic Torripsamments. The Olympus soils are: loamy, mixed, superactive, thermic Arenic Haplargids. The Olympus soils have an argillic horizon beginning at about 37 inches with sands and coarse sands above the argillic horizon. Cajon and Olympus soils tend to be slightly to moderately alkaline and have effervescence throughout.

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

Map unit ID: Map unit name: component ; local phase; percent (Map units with multiple components have the components listed below the map unit name.)

3509;Cajon-Goldivide complex, 2 to 8 percent slopes; Cajon;rarely flooded;4 and Olympus;rarely flooded;2
4280;Mekkadale-Edalph association, 4 to 30 percent slopes;Cajon;rarely flooded;8
4440;Dragonwash association, 2 to 4 percent slopes;Cajon;rarely flooded;5

Table 4. Representative soil features

Parent material	(1) Alluvium–granite
Surface texture	(1) Sand (2) Gravelly loamy sand
Family particle size	(1) Sandy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Slow to rapid
Soil depth	152 cm
Surface fragment cover <=3"	65–75%
Surface fragment cover >3"	0–5%

Available water capacity (0-101.6cm)	4.32–8.64 cm
Calcium carbonate equivalent (0-101.6cm)	0–4%
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)	7–8.3
Subsurface fragment volume <=3" (Depth not specified)	5–45%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This ecological site describes the dynamics of a low intensity, braided stream system. The distinguishing features are the low intensity, braided drainage pattern and the unique presence of Hall's shrubby spurge. This ecological site occurs primarily on first and second order ephemeral drainages, with rare to occasional flash flood events. These flash flood events disperse across the broad, unconfined, braided drainageways and inset fans that this site occurs on. Because of the diffusion of flow, flood intensity is low. Hall's shrubby spurge and creosote bush dominate but there is a complex of plant communities present depending upon flood disturbance.

Soil disturbance from flash flood events is the primary driver of plant community dynamics within this ecological site. Ephemeral streams lack permanent flow except in response to rainfall events (Bull 1997, Levick et al. 2008). These ephemeral streams are characterized by extreme and rapid variations in flooding regime, and a high degree of temporal and spatial variability in hydrologic processes (Bull 1997, Stanley et al. 1997, Levick et al. 2008, Shaw and Cooper 2008).

This broad low energy wash typically occurs as a side channel to a larger ephemeral stream, primarily the Frequently Flooded Warm Thermic Ephemeral Stream (R030XY010CA). R030XY010CA occurs in large drainageways, and desert willow is a distinguishing species. In some instances, this ecological site does not connect with a larger drainage system, and surface flow eventually infiltrates into the substratum, where the active channel is replaced with upland vegetation. In some areas the Mid Size Thermic To Hyperthermic Ephemeral Stream (R030XY186CA), occurs upstream from this site, where flow is concentrated between fan remnants and catclaw acacia is a dominant shrub.

This site often has a braided channel caused by varying degrees of channel avulsion (defined as the "diversion of the majority of the surface flow to a different channel, with total or partial abandonment of the original channel" [(Field 2001)]). As sediment deposits in the active drainageway, the likelihood of channel avulsion increases because of decreased drainageway volume. Cycles of channel avulsion on alluvial fans are an ongoing and long-term process in the development of alluvial fans, and can occur after any substantial overland flow event when existing channel capacity is rapidly and dramatically exceeded.

Hall's shrubby spurge is a rare plant endemic to southeastern California and Western Arizona. It occurs as a dominant shrub on a range of soils and landforms around Cottonwood Springs and the Eagle Mountains of Joshua Tree National Park, with a more localized distribution in other parts of its range (Dressler 1954). There is little research about the life cycle, drought and fire response of this species. Other dominant plants associated with this ecological site are creosote bush, peach thorn (*Lycium cooperi*), jojoba (*Simmondsia chinensis*), desertsenna (*Senna armata*), and burrobrush (*Hymenoclea salsola*). Peachthorn, hall's shrubby spurge, creosote bush and occasionally catclaw acacia are present along the channel margins of this site or on raised bars within the active flooding zone. Individuals are larger and more productive in the wash than in neighboring alluvial fans, without additional run-on. Burrobrush is a pioneer species that can quickly colonize disturbed areas, and may establish in ephemeral washes and upland sites (Sawyer et al. 2009). In this ecological site, it is dominant in channels where flooding frequency is highest.

Other disturbances such as drought, fire, and human hydrologic alterations can affect the community composition and/or hydrologic process of this site. Cycles of drought are characteristic of the desert, and can cause mortality or die-back of vegetation. Decreased vegetative cover can lead to increased erosion and change sediment deposition patterns, possibly increasing the likelihood of channel migration.

Historically fire was very uncommon in these ephemeral drainages; however the presence of continuous and flashy fuels from non-native grasses in adjacent upland sites can increase the possibility of fire. Invasion by non-native annual grasses has increased the flammability of desert vegetation communities (Brooks 1999, Brooks et al. 2004), and after fire, Mojave Desert ecosystems appear to be more susceptible to invasion by exotic grasses, leading to a grass-fire cycle (D'Antonio and Vitousek 1992). Very wet (El Nino) years followed by severe drought produce conditions where large areas where creosote scrub burn (Brown and Minnich 1986, DeFalco et al. 2010).

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 stream side 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, and loss of vegetation, and channel entrenchment can have irreversible impacts on hydrologic processes (Nishikawa et al. 2004, Levick et al. 2008). An increase in cover of impermeable surfaces 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 urban areas, ephemeral streams are sometimes armored 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 vegetation. This loss of root structure along the stream increases scour potential, and the loss of above ground vegetation will increase flow velocity.

State and transition model

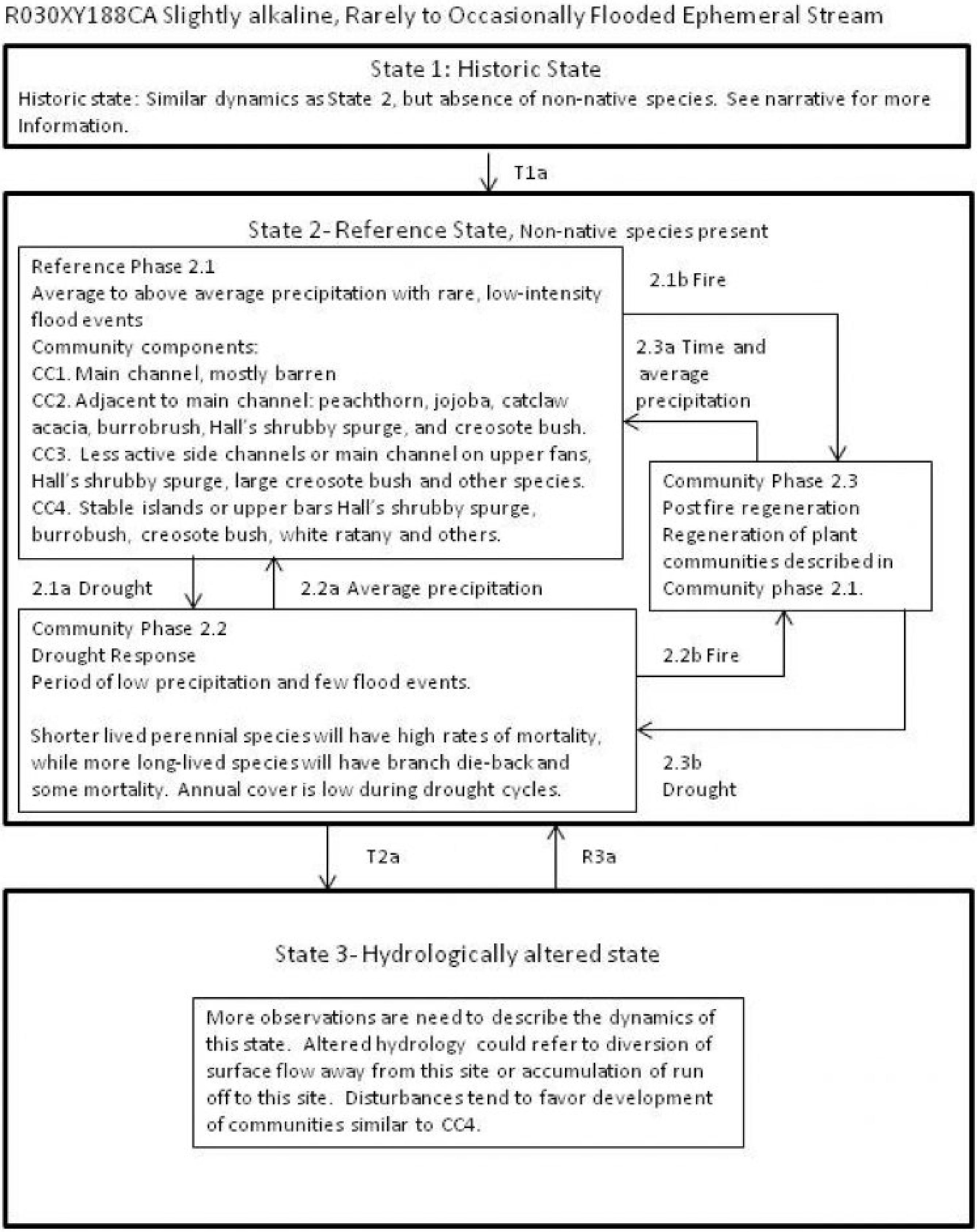

Figure 4. R030XY188CA Model

State 1
Natural state

State 1 represents the historic-natural condition for this ecological site. This state no longer exists due to the ubiquitous naturalization of non-native species in the Mojave Desert. 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 significant in State 2, but has not yet altered the hydrology or fire frequency. Historically, stand-replacing fire was probably very rare in this ecological site due to the absence of non-native grasses to fuel fires (Sawyer et al. 2009). When fire did occur, it was probably low severity surface fire that promoted regeneration of short-lived species (Sawyer et al. 2009).

State 2
Reference State

This state is similar to the natural state, but has non-native forbs present.

Community 2.1
Reference Phase

Figure 5. Main channel

Figure 6. Adjacent to main channel

Figure 7. Side channels and upper fans

Figure 8. Stable areas and upper bars

This community phase is dependent upon unimpaired hydrologic function and average to above average precipitation. It is difficult to define " normal" or "average" precipitation in desert climates, because of high variability between years and the patchy distribution of precipitation when it does occur. In this case, normal precipitation is referring to the long term average annual precipitation which would be between 4 and 7 inches for this ecological site. There are several distinguishable zones of plant communities within this ecological site, but data was not collected consistently within each zone. Thus, the data for different zones is combined into the tables below. The dominance of species within each zone is described under the community component description and is based on personal observations and interpretation of data. Four community components are present, including: Community Component 1 (CC1): Barren active channel. Community Component 2 (CC2): This community dominates, and is present on broad, rarely flooded drainageways. Rare flash flood events provide moisture and surface disturbance, which enables species such as peaththorn, catclaw acacia, jojoba, California jointfir, and burrobrush, to establish. Hall's shrubby spurge and creosote are present, but are less common in the more active flooding areas. Forbs are abundant in years of high rainfall, but may be patchily present every year due to run-on. Common forbs include bristly fiddleneck (*Amsinckia tessellata* var. tessellate, suncup (Camissonia), cryptantha (Cryptantha sp.), Western Mojave buckwheat (*Eriogonum mohavense*), smooth desertdandelion (*Malacothrix glabrata*), phacelia (Phacelia sp.), popcornflower (Plagiobothrys sp.), chia (*Salvia columbariae*), and small wirelettuce (*Stephanomeria exigua* ssp. exigua). Community Component 3 (CC3) This community is on less active braided channels or higher on the fan where there is less flow. Hall's shrubby spurge and large creosote bush may comprise 15 to 25 percent cover. Peachthorn and burrobrush may be present, as well as the forbs listed in CC2. Community Component 4 (CC4) This community is found on stable islands or interfluves between braided channels. It resembles the upland plant community on the adjacent alluvial fans or fan remnants. Creosote bush and Hall's shrubby spurge are dominant, and burrobush (*Ambrosia dumosa*), white ratany (Krameria greyii), dessertsenna, branched pencil cholla (*Cylindropuntia ramosissima*), and Mojave yucca (*Yucca schidigera*) are important secondary shrubs. The non-native annual grasses red brome and Mediterranean grass are usually present, but with only a trace or up to 5 percent cover, in CC2 to CC4. The non-native annual forb, redstem stork's bill (*Erodium cicutarium*), is abundant in more stable areas. One or multiple years of heavy winter precipitation such as occurs during El Niño events (Hereford et al. 2006) leads to a heavy standing crop of non-native and native annuals in intershrub spaces, providing a continuous fine fuel layer that puts this community at high risk of fire. Native annuals may fuel fire (Brown and Minnich 1986, Minnich 2003), but pose a threat only in the first dry year following a wet year (Minnich 2003). The thatch created from non-native annual grasses is much slower to break down, and can create high-risk fire conditions for several years following heavy precipitation (Minnich 2003, Brooks and Minnich 2006, Brooks et al. 2007, Rao et al. 2010). Flood events help maintain open spaces among the shrubs, so this site is unlikely to build continuous fuels or convert to a fire-altered annual grass state.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	112	280	504
Forb	11	84	168
Grass/Grasslike	–	6	11
Total	**123**	**370**	**683**

Community 2.2
Drought Response

This community develops with prolonged or severe drought. A one to two year severe drought or a longer duration drought of less severity can cause mortality and die-back of vegetation. Effects of drought have been documented when precipitation is 60 percent (or less) of the average annual precipitation (Miriti et al. 2007). Sixty percent of the normal precipitation for this site would mean years with 2 to 4 inches of mean annual precipitation could affect the vegetation. Drought can cause high mortality in short lived perennials, and long-lived shrubs may have severe branch die back, or mortality depending upon severity and duration of the drought. Long lived shrubs, affected by previous drought are more likely to succumb during a second drought (Hereford et al. 2006). A long-term monitoring study in the adjacent upland plant community found long-periods of stability under average conditions and moderate drought, but high rates of mortality resulting from one year of extreme drought. Following severe drought in 2002, burrobush suffered 68% mortality, Hall's shrubby spurge 58%, short-lived shrubs and subshrubs up to 100% mortality, but virtually no mortality in creosote bush (Miriti et al. 2007). Seed development, germination, and seedling survival are negatively affected during drought years. In the absence of flood events, seeds are not dispersed by sheet flow, and moisture is lacking in the soil to initiate germination. Some shrubs, such as California jointfir, only produce seed in years of normal or higher than average precipitation. Seedling survival is dependent upon adequate moisture during the early stages of development. With prolonged or severe drought, canopy cover declines leaving more open spaces susceptible to erosion during the next flood event. Since this site is in areas of water accumulation, it may be slower to respond to drought than the surrounding drier terrain. During moderate droughts it could harbor species for seed dispersal to more drought prone areas when average precipitation returns.

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) in upland communities as well as ephemeral drainageways. There is not data to describe the post fire community response. This phase is based on literature review. There may be high variability in the species response in the post-fire regeneration phase. The composition of the post-fire regeneration community depends upon the species present before the fire, fire intensity, precipitation patterns, and time since last fire. This community phase is characterized by severe declines in creosote bush, other short-live shrubs and perennials. The effects of fire on Hall's shrubby spurge are unknown, but high mortality is assumed. Creosote bush is generally killed by fire, and is slow to re-colonize burned areas due to specific recruitment requirements (Brown and Minnich 1986, Brooks et al. 2007, Steers and Allen 2011). Burrobush colonizes burned areas from seed relatively quickly, and provides cover under which creosote bush can re-establish. There is no information in the literature on the fire tolerance of Hall's shrubby spurge. Since it is a slow-growing long-lived shrub that occurs in an ecosystem that very rarely experiences fire, it is presumed that fire tolerance is low, but data is needed to confirm this. Creosote bush communities in the Mojave desert may resemble the natural range of variation found in pre-fire conditions in terms of species composition in as little as nineteen years (Engel and Abella 2011), but creosote communities in the Colorado Desert may show little recovery after 30 years (Steers and Allen 2011). The timing and severity of fire, as well as post-fire climate conditions determines trajectories of recovery (Brown and Minnich 1986, Steers and Allen 2011). Initially, the post-burn community is dominated by non-native grasses (red brome, Mediterranean grass), native annuals and native subshrubs. Native annuals likely to be present include smooth desert dandelion, bristly fiddleneck, chia, and small wirelettuce, but many different species could be present at a particular site. With time, shrub cover increases with the recovery of species capable of resprouting including Mojave yucca, white ratany, Californi jointfir, peachthorn, catclaw acacia, and jojoba. Colonization from off-site seed occurs for short-lived shrubs such as burrobush, burrobrush and dessertsenna. As shrub cover increases, safe sites for creosote bush and Hall's shrubby spurge recruitment increases. With a long period of time without fire, creosote bush and Hall's shrubby spurge regain co-dominance as shorter-lived species die out. This community is an at-risk phase, as the increased cover and biomass of non-native annual grasses increases the likelihood of repeat burning (D'Antonio and Vitousek 1992, Brooks et al. 2004). If the fire return interval is less than 20 years, this community is very likely to transition to State 3. If extreme precipitation events follow fire, and especially if upslope hill communities also burned, then this community phase is vulnerable to increased sedimentation or channel entrenchment. This is because upslope 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).

Pathway 2.1a
Community 2.1 to 2.2

This pathway is caused by a prolonged or severe drought.

Pathway 2.1b
Community 2.1 to 2.3

This pathway is caused by moderate to severe fire.

Pathway 2.2a
Community 2.2 to 2.1

This pathway occurs with the return of average to above average precipitation and associated flood events.

Pathway 2.2b
Community 2.2 to 2.3

This pathway occurs as a result of fire. Given low cover of annuals during drought, this pathway is unlikely except in periods immediately following heavy precipitation years.

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 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
Altered Hydrology State

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

Community 3.1
Hydrologically Altered

Roads and aqueducts may impact surface flow and either divert more flow to or away from the drainage. A road crossing a drainage may shift sediment deposition patterns by causing sediments to accumulate upstream from the road, and to be scoured away below the road. The alteration of sediment transport can cause channel entrenchment (Bull 1997). 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).

Transition 2a
State 2 to 3

Triggers that can cause a transition to State 3 include 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 vegetation density (and upland vegetation density) leave soils more susceptible to erosion (Bull 1997).

Restoration pathway R3a
State 3 to 2

Restoration from State 3 back to State 2 would be an intensive task. Individual site assessments would be required to determine proper restoration methods. Some hydrological modifications are not feasible restored, such as ground water depletion. However, road diversions can be redesigned to allow proper stream alignment and flow. Seeds or plants of appropriate species may need to be reintroduced to the restored channels.

Additional community tables

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
1	**Shrubs**			112–560	
	creosote bush	LATR2	*Larrea tridentata*	112–504	5–18
	Mojave yucca	YUSC2	*Yucca schidigera*	0–73	0–5
	Hall's shrubby-spurge	TEHA	*Tetracoccus hallii*	6–56	3–20
	peach thorn	LYCO2	*Lycium cooperi*	0–28	0–3
	burrobrush	HYSA	*Hymenoclea salsola*	0–22	1–4
	burrobush	AMDU2	*Ambrosia dumosa*	0–17	0–2
	littleleaf ratany	KRER	*Krameria erecta*	0–17	0–1
	white ratany	KRGR	*Krameria grayi*	0–17	0–1
	jojoba	SICH	*Simmondsia chinensis*	0–11	0–2
	branched pencil cholla	CYRA9	*Cylindropuntia ramosissima*	0–11	0–1
	California jointfir	EPCA2	*Ephedra californica*	0–11	0–1
	desertsenna	SEAR8	*Senna armata*	0–2	0–20
	catclaw acacia	ACGR	*Acacia greggii*	0–1	0–55
Forb					
2	**Forbs**			11–168	
	bristly fiddleneck	AMTET	*Amsinckia tessellata var. tessellata*	1–157	0–2
	small wirelettuce	STEXE	*Stephanomeria exigua ssp. exigua*	0–11	0–2
	chia	SACO6	*Salvia columbariae*	1–3	10–30
	Western Mojave buckwheat	ERMO3	*Eriogonum mohavense*	0–1	0–7
	smooth desertdandelion	MAGL3	*Malacothrix glabrata*	0–1	0–1
	phacelia	PHACE	*Phacelia*	0–1	0–1
	popcornflower	PLAGI	*Plagiobothrys*	0–1	0–1
	suncup	CAMIS	*Camissonia*	0–1	0–1
	cryptantha	CRYPT	*Cryptantha*	0–1	0–1
3	**non-native forbs**			0–129	
	redstem stork's bill	ERCI6	*Erodium cicutarium*	0–129	0–4
Grass/Grasslike					
4	**non-native annual grasses**			0–11	
	Mediterranean grass	SCHIS	*Schismus*	0–6	0–2
	red brome	BRRU2	*Bromus rubens*	0–6	0–1

Animal community

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

Hydrological functions

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

Recreational uses

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

Other products

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

The leaves and twigs of burrobrush are also used for medicinal purposes (Tesky 1993).

California ephedra is made into tea by Native Americans. It contains the chemical Ephedrine, which is used to treat asthma and as a decongestant among other things. It has been restricted to a prescription drug, due to adverse reactions or misuse.

The peachthorn fruits were eaten by Native Americans (Thompson 2007).

Inventory data references

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

POWA20
POWA34
POWA62 Type location
POWA86

Type locality

Location 1: San Bernardino County, CA	
UTM zone	N
UTM northing	3740008
UTM easting	612034
General legal description	The type location is in Joshua Tree National Park about 3 miles northeast of the Cottonwood visitors center, and about .2 miles west of the road.

Other references

Brooks, M. L. 1999. Habitat invasibility and dominance by alien annual plants in the western Mojave Desert. Biological Invasions 1:325-337.

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., T. C. Esque, and T. Duck. 2007. Creosotebush, blackbrush, and interior chaparral shrublands. RMRS-GTR-202.

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.
D'Antonio, C. M. and P. M. Vitousek. 1992. Biological invasions by exotic grasses, the grass/fire cycle, and global change. Annual Review of Ecology and Systematics 23:63-87.

DeFalco, L. A., T. C. Esque, S. J. Scoles-Sciulla, and J. Rodgers. 2010. Desert wildfire and severe drought diminish survivorship of the long-lived Joshua tree (Yucca brevifolia; Agavaceae). American Journal of Botany 97:243-250.

Dressler, R. L. 1954. Some floristic relationships between Mexico and the United States. Rhodora 56:81-96.

Engel, E. C. and S. R. Abella. 2011. Vegetation recovery in a desert landscape after wildfires: influences of community type, time since fire and contingency effects. Journal of Applied Ecology 48:1401-1410.

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

Hereford, R., R. H. Webb, and C. I. Longpre. 2006. Precipitation history and ecosystem response to multidecadal precipitation variability in the Mojave Desert region, 1893-2001. Journal of Arid Environments 67:13-34.

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.

Minnich, R. A. 2003. Fire and dynamics of temperature desert woodlands in Joshua Tree National Park. Contract, Joshua Tree National Park.

Miriti, M. N., S. Rodriguez-Buritica, S. J. Wright, and H. F. Howe. 2007. Episodic death across species of desert shrubs. Ecology 88:32-36.

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.

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.

Tesky, J. L. 1993. *Hymenoclea salsola*. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory.

Thompson, J. 2007. Plants of Death Valley and Amargosa Valley used by Native Americans. Beatty Museum & Historical Society in Beatty, Nevada. , Beatty, NV.

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

Indicators

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

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

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

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

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

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

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

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

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

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

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

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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

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17. **Perennial plant reproductive capability:**
