Ecological site R030XD010CA
Frequently Flooded, Gravelly, Hyperthermic To Warm-Thermic Ephemeral Stream

Last updated: 10/21/2024
Accessed: 08/21/2026

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 030X–Mojave Basin and Range

MLRA statement: Major Land Resource Area (MLRA) 30, Mojave Desert, is found in southern California, southern Nevada, the extreme southwest corner of Utah and northwestern Arizona within the Basin and Range Province of the Intermontane Plateaus. The climate of the area is hot (primarily hyperthermic and thermic; however at higher elevations, generally above 5000 feet, mesic, cryic and frigid) and dry (aridic). Elevations range from below sea level to over 12,000 feet in the higher mountain areas found within the MLRA. Due to the extreme elevational range found within this MLRA, land resource units (LRUs) were designated to group the MLRA into similar land units.

LRU notes

"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).

Classification relationships

Sawyer, J.O. and T. Keeler-Wolf. 1995. Manual of California Vegetation - Catclaw Acacia Series NDDB/Holland Type and Status: Mojavean Desert Scrub (43000), Riparian Scrubs (63000). Mojave Wash Scrub (34250) G3 S3.2 Mojave Desert Wash Scrub (63700) G3 S2.1 Barry Type: G7411124 Brown Lowe Pase type: 143.153, 153.141, 154.123, 153.161 Cheatham & Haller type: Desert Dry Wash Woodland. PSW-45 type: Catclaw Series. Stone & Sumida (1983): Wash Community Thorne Type: Desert Microphyll Woodland WHR Type: Desert Wash

Ecological site concept

This ecological site occurs on third order or larger ephemeral drainages. The landforms are drainageways, channels, and inset fans. Elevations range from 1030 to 3790 feet, with 0 to 8 percent slopes. This site is associated with hyperthermic and warm thermic soils. Large, occasional to frequent flash flood events shape this ecological site. Although this site has large drainage basins it is located on medial and distal positions of alluvial fans, where flow volume and velocity has slowed, and sediment transport is predominately sands and gravels. The main channels provide a deep water source and a frequent flooding regime, which support desert willow (Chilopsis linearis), catclaw acacia (Acacia greggii) and smoketree (Psorothamnus spinosus). A range of flooding intensities along and across the drainageway supports several community components. Data ranges in the physiographic data, climate data, water features, and soil data sections of this Ecological Site Description are based on major components (15 percent of map unit or more). This is a group concept and provisional STM that also covers the following ecological sites: R030XY001CA,R030XY010CA, R030XY038CA, R030XB131CA, R030XB145CA, R030XY128CA, R030XB128CA

Associated sites

R030XD002CA	**Desert Pavement** This ecological site is on stable fan remnants with desert pavement.
R030XD015CA	**Hyper-Arid Fans** This ecological site is on adjacent alluvial fans, with hyperthermic soils and creosote bush and burrobrush are present.
R030XY159CA	**Gravelly Outwash** This ecological site is on adjacent fan aprons with creosote and desert senna.
R030XY188CA	**Slightly Alkaline, Rarely To Occasionally Flooded Ephemeral Stream** This ephemeral stream is on smaller drainageways, and Hall's shrubby spurge and creosote bush are common.

Similar sites

R030XY001CA	**Occasionally Flooded, Hyperthermic, Diffuse Ephemeral Stream** This ecological site has smaller drainage area, and has a diffuse braided channel, Schott's dalea and creosote bush dominate.
R040XD010CA	**Valley Wash** This ephemeral stream is similar to this site, but is in the Sonoran Desert, which is hotter and has more precipitation during summer from monsoons and blue paloverde is present.

Table 1. Dominant plant species

Tree	(1) *Chilopsis linearis* (2) *Psorothamnus spinosus*
Shrub	(1) *Hymenoclea salsola* (2) *Acacia greggii*
Herbaceous	(1) *Malacothrix glabrata* (2) *Pectocarya recurvata*

Physiographic features

This ecological site occurs on channels, drainageways, bars on drainageways, inset fans, and occasionally the adjacent fan apron. Elevations range from 1030 to 3790 feet. Slopes are generally 2 to 4 percent, but range from 0 to 8 percent.

Table 2. Representative physiographic features

Landforms	(1) Channel (2) Drainageway (3) Inset fan
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	None to frequent
Elevation	310 – 1,160 m
Slope	0 – 10 %
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 178 millimeters (3 to 7 inches) and the mean annual air temperature is 17 to 23 degrees C (63 to 73 degrees F.). The frost-free season is 280 to 340 days, and the freeze-free season is 310 to 360 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 with Twentynine palms weighted twice).

Table 3 Representative climatic features

Frost-free period (average)	340 days
Freeze-free period (average)	360 days
Precipitation total (average)	180 mm

Influencing water features

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

Soil features

The soils associated with this ecological site are very deep, well to excessively drained, and formed in alluvium from granitoid, gneiss and igneous rock or mixed parent material. The surface textures are very gravelly loamy sand, gravelly loamy sand, sand, gravelly coarse sand and gravelly sand. Subsurface horizons (1 to 59 inches) are composed of sandy textures with gravelly to extremely gravelly modifiers. Surface rock fragments less than 3 inches range from 20 to 75 percent cover, and fragments greater than 3 inches range from 0 to 35 percent cover. Subsurface percent by volume of rock fragments less than 3 inches ranges from 5 to 65, and greater that 3 inch fragments range from 0 to 20.

Soils with thermic soil temperature regimes associated with this site include: Arizo and Dragonwash– sandy-skeletal, mixed, thermic

Typic Torriorthents; and Burntshack – loamy, mixed, superactive, thermic Arenic Haplargids. The Burntshack soils are an unusual soil for ephemeral streams, because they have soil development indicating soil stability. However, there is almost 23 inches of coarse sand over the argillic horizons, which is from more recent alluvium. The lower horizons have gravelly sandy loam and gravelly loamy sand textures. The presence of xeroriparian vegetation and obvious flood disturbance may indicate that the channel has recently migrated to this area, or that by the time stream flow reaches this point, it does not have enough power to erode the deeper soils or transport large volumes of sediment. The difference between the Arizo soils and the Dragonwash soils is that the Dragonwash soils are dominated by fine gravel (2 to 5 millimeters) within the particle size control section.

Soils with hyperthermic soil temperature regimes associated with this site include: Carrizo – sandy-skeletal, mixed, hyperthermic Typic Torriorthents and Pintobasin – mixed, hyperthermic Typic Torripsamments.

The Pintobasin and Burntshack soils are non-skeletal (35 percent rock fragments in the particle control section, while the other soils are skeletal.

This ecological site has been correlated with major components in the following map units within the Joshua Tree National Park Soil Survey (CA794):

Map unit ID; Map unit name; Component; Phase; Percent
2405; Carrizo complex, 0 to 4 percent slopes; Carrizo; occasionally flooded; 25
2406; Pintobasin-Carrizo association, 0 to 2 percent slopes;Carrizo; occasionally flooded;40 and Pintobasin; frequently flooded; 50
2407; Pintobasin-Carrizo association, 2 to 4 percent slopes; Carrizo; occasionally flooded; 30
and Carrizo; frequently flooded; 20
3526; Cajon-Hypoint-Arizo association, 1 to 4 percent slopes; Arizo;occasionally flooded; 15
3612; Burntshack association, 2 to 4 percent slopes; Burntshack; occasionally flooded; 20
4440; Dragonwash association, 2 to 4 percent slopes; Dragonwash; frequently flooded; 35
and Dragonwash; occasionally flooded; 55

This ecological site is associated with an additional 16 map units with minor components including: Arizo, frequently flooded; Arizo, occasionally flooded; Carrizo, frequently flooded; Carrizo, occasionally flooded; Carrizo, occasionally flooded, channeled; Joetree, frequently flooded; Pintobasin, frequently flooded; and Pintobasin occasionally flooded, broad. The Joetree soil is a unique soil similar to Pintobasin, except is has a buried argillic horizon below 100 cm (39 inches).

Table 4. Representative soil features

Parent material	(1) Alluvium – granite
Surface texture	(1) Very gravelly loamy sand (2) Gravelly sand (3) Gravelly loamy sand
Family particle size	(1) Sandy
Drainage class	Well drained to excessively drained
Permeability class	Very slow to rapid
Soil depth	150 cm
Surface fragment cover <=3"	20 – 80 %
Surface fragment cover >3"	0 – 40 %

Available water capacity (0-101.6cm)	1.02 – 13.72 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 10 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	10 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	10 – 70 %
Subsurface fragment volume >3" (Depth not specified)	0 – 20 %

Ecological dynamics

This ecological site occurs on third order or larger ephemeral drainages. The landforms are drainageways, channels, and inset fans. This site is associated with hyperthermic and warm thermic soils. Large, occasional to frequent flash flood events shape this ecological site. Although this site has large drainage basins, it is located on medial and distal positions of alluvial fans where volume and velocity of the stream flow has slowed, and sediment transport is predominately fine materials (such as sands and gravels). The main channels provide a deep water source and a frequent flooding regime, which support desert willow (Chilopsis linearis), catclaw acacia (Acacia greggii) and smoketree (Psorothamnus spinosus). A range of flooding intensities along and across the drainageway supports several community components.

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 vary 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 of the increased availability of water and flood disturbances in these drainageways. Desert willow, smoketree, and catclaw acacia are present along active channel margins. These species are phreatophytes, that is, they have deep roots and primarily rely on a deep water source. A deep water source typically refers to a water table or a zone of saturated soils. However, these ephemeral desert streams do not generally have water tables within reach of plant roots, and here plants are accessing deep ground water (Nilsen et al. 1984). Catclaw acacia and mixed shrubs are present on adjacent overflow flood zones, and upland shrubs are present on stable islands. Collectively, all of 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 medial to distal positions 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 (Larrea tridentata).

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.

The associated 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.

Offsite as well as onsite 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 generally scour and incise. 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 phreatophytes, such as desert willow and catclaw acacia, potentially eliminating this species from certain areas.

State and transition model

Figure 3. R030XY010CA Model

Additional community tables

Table 5. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Tree					
1	**Trees**			0-448	
	desert willow	CHLI2	*Chilopsis linearis*	0-336	0-3
	smoketree	PSSP3	*Psorothamnus spinosus*	0-112	0-9
Shrub/Vine					
2	**Shubs**			56-325	
	catclaw acacia	ACGR	*Acacia greggii*	6-202	0-8

	bladderpod spiderflower	CLIS	*Cleome isomeris*	1-135	1-4
	creosote bush	LATR2	*Larrea tridentata*	0-105	0-6
	Schott's dalea	PSSC5	*Psorothamnus schottii*	0-84	0-6
	burrobrush	HYSA	*Hymenoclea salsola*	11-69	1-13
	sweetbush	BEJU	*Bebbia juncea*	0-45	0-11
	Mojave rabbitbrush	ERPA29	*Ericameria paniculata*	0-37	0-6
	desertsenna	SEAR8	*Senna armata*	0-34	0-2
	jojoba	SICH	*Simmondsia chinensis*	0-22	0-2
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	0-18	0-4
	branched pencil cholla	CYRA9	*Cylindropuntia ramosissima*	0-16	0-1
	Mexican bladdersage	SAME	*Salazaria mexicana*	0-15	0-3
	peach thorn	LYCO2	*Lycium cooperi*	0-11	0-1
	white ratany	KRGR	*Krameria grayi*	0-10	0-1
	Wiggins' cholla	CYEC3	*Cylindropuntia echinocarpa*	0-3	0-1
	Mojave yucca	YUSC2	*Yucca schidigera*	0-3	0-1
	beavertail pricklypear	OPBA2	*Opuntia basilaris*	0-1	0-1
	desert lavender	HYEM	*Hyptis emoryi*	0-1	0-1
	burrobush	AMDU2	*Ambrosia dumosa*	0-1	0-1
Forb					
3	**Forb perennial**			0-34	
	hairy milkweed	FUHI	*Funastrum hirtellum*	0-18	0-4
	desert starvine	BRBI	*Brandegea bigelovii*	0-17	0-1
	desert dodder	CUDE2	*Cuscuta denticulata*	0-17	0-1
	coyote gourd	CUPA	*Cucurbita palmata*	0-7	0-1
	wishbone-bush	MILAV	*Mirabilis laevis var. villosa*	0-3	0-1
	mesquite mistletoe	PHCA8	*Phoradendron californicum*	0-2	0-1
	birdcage evening primrose	OEDE2	*Oenothera deltoides*	0-1	0-1
	pepperweed	LEPID	*Lepidium*	0-1	0-1
4	**Forb annual**			0-146	
	curvenut combseed	PERE	*Pectocarya recurvata*	0-90	0-6
	smooth desertdandelion	MAGL3	*Malacothrix glabrata*	0-45	0-16
	western tansymustard	DEPI	*Descurainia pinnata*	0-45	0-1
	bristly fiddleneck	AMTE3	*Amsinckia tessellata*	0-34	0-2
	pincushion flower	CHFR	*Chaenactis fremontii*	0-13	0-5
	distant phacelia	PHDI	*Phacelia distans*	0-6	0-2
	cryptantha	CRYPT	*Cryptantha*	0-4	0-4
	sowthistle desertdandelion	MASO	*Malacothrix sonchoides*	0-3	0-2
	brittle spineflower	CHBR	*Chorizanthe brevicornu*	0-3	0-1
	buckwheat	ERIOG	*Eriogonum*	0-1	0-9
	Western Mojave buckwheat	ERMO3	*Eriogonum mohavense*	0-1	0-2
	suncup	CAMIS	*Camissonia*	0-1	0-2
	desert thorn-apple	DADI2	*Datura discolor*	0-1	0-1
	pygmy poppy	ESMI	*Eschscholzia minutiflora*	0-1	0-1
	Schott's calico	LOSC6	*Loeseliastrum schottii*	0-1	0-1
	lupine	LUPIN	*Lupinus*	0-1	0-1
	blazingstar	MENTZ	*Mentzelia*	0-1	0-1

	purplemat	NADE	*Nama demissum*	0-1	0-1
	chia	SACO6	*Salvia columbariae*	0-1	0-1
	small wirelettuce	STEX	*Stephanomeria exigua*	0-1	0-1
	phacelia	PHACE	*Phacelia*	0-1	0-1
5	**Forb non-native**			0-168	
	Asian mustard	BRTO	*Brassica tournefortii*	0-168	0-1
	redstem stork's bill	ERCI6	*Erodium cicutarium*	0-29	0-4
Grass/Grasslike					
6	**non-native grasses**			0-7	
	common Mediterranean grass	SCBA	*Schismus barbatus*	0-7	0-7
	Mediterranean grass	SCHIS	*Schismus*	0-2	0-1
	red brome	BRRU2	*Bromus rubens*	0-1	0-1

Table 6. Community 2.2 plant community composition

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

Table 7. Community 2.3 plant community composition

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

Table 8. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	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, catclaw acacia, and smoketree, 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

This site is well suited for many types of recreation. Bird watching would be excellent here, since the desert trees attract many resident and migrant birds. Since this site is the drainage for much of the surrounding area, even in drought years some plants in the wash flower, providing opportunities for photography. Naturalists would find the wash fascinating for its diversity of shrubs and abundant wildflowers in wet years, and especially for its desert trees.

Other 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).

Inventory data references

The following NRCS vegetation plots were used to describe this ecological site: CC1 and CC2 POWA88 DD-32 type location CC3 PIMO08 217-172-2 PIMO07b 1249704001 1249704016 WAWA04 (poor data) CC4 DD-33 PIMO07A Y-34 CC5 POWA92

Type locality

Location 1: San Bernardino County, CA	
UTM zone	N
UTM northing	3746832
UTM easting	616153
General legal description	The type location is in Pintobasin, about a half mile east of Old Dale Road, and about 7 miles north of the Old Dale and Black Eagle Mine Road in Joshua Tree National Park.

Other references

Bainbridge, D. E. 2007. A guide for desert and dryland restoration: new hope for arid lands Island Press, Washington, D.C.

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.

Gardner, J. L. 1951. Vegetation of the creosotebush area of the Rio Grande Valley in New Mexico. . Ecological Monographs 21:379-403.

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.

Johnson, R. R., Bennet, P.S., Haight, L.T., S. W. Carothers, and J. M. Simpson. 1984. A riparian classification system. Pages 375-383 in R. E. Warner and K. M. Hendrix, editors. California riparian systems. University of California Press, Berkeley, CA.

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.

Magill, A. W. 1974. Chilopsis linearis (Cav.) Sweet desertwillow. U.S. Department of Agriculture, Forest Service, Washington, DC.

Nilsen, E. T., M. R. Sharifi, and P. W. Rundel. 1984. Comparative water relations of phreatophytes in the Sonoran Desert of California. Ecology 65:767-778.

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.

Approval

Kendra Moseley, 10/21/2024

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	08/21/2026
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):**

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

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

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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

17. **Perennial plant reproductive capability:**