USDA Natural Resources
Conservation Service

Ecological site R030XB004NV
SANDY 5-7 P.Z.

Last updated: 3/11/2025
Accessed: 05/12/2025

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.

Ecological site concept

This site occurs on fan remnants, fan skirts, and sand sheets on all exposures. Slopes range from 0 to 30 percent, but slope gradients of 2 to 15 percent are most typical. Elevations are 600 to 4500 feet. The soils associated with this site are very deep and well drained to excessively drained.

This site is also covered under group concept R030XB148CA.

Associated sites

R030XB037NV	**LIMY SAND 5-7 P.Z.**
R030XB063NV	**SANDHILL 5-7 P.Z.**

Similar sites

R030XB039NV	**LIMY FAN 5-7 P.Z.** more productive site; MUPO2 important species
R030XB063NV	**SANDHILL 5-7 P.Z.** ACHY-PLRI3 codominant; more productive site; occurs on sand dunes
R030XB037NV	**LIMY SAND 5-7 P.Z.** less productive site
R030XB054NV	**SANDY 3-5 P.Z.** less productive site; MESP2 and KRLA2 minor species
R030XB121NV	**SANDY PLAIN 3-5 P.Z.** more productive site; on broad alluvial plains

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Ambrosia dumosa*
Herbaceous	(1) *Pleuraphis rigida* (2) *Achnatherum hymenoides*

Physiographic features

This site occurs on fan remnants, fan skirts, and sand sheets on all exposures. Slopes range from 0 to 30 percent, but slope gradients of 2 to 15 percent are most typical. Elevations are 600 to 4500 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Fan skirt (3) Sand sheet
Elevation	183–1,372 m
Slope	0–30%
Aspect	Aspect is not a significant factor

Climatic features

The climate of the Mojave Desert has extreme fluctuations of daily temperatures, strong seasonal winds, and clear skies. The climate is arid and is characterized with cool, moist winters and hot, dry summers. Most of the rainfall falls between November and April. Summer convection storms from July to September may contribute up to 25 percent of the annual precipitation. Average annual precipitation is 5 to 7 inches. Mean annual air temperature is 56 to 65 degrees F. The average growing season is about 190 to 240 days.

Table 3. Representative climatic features

Frost-free period (average)	7 days
Freeze-free period (average)	
Precipitation total (average)	6,096 mm

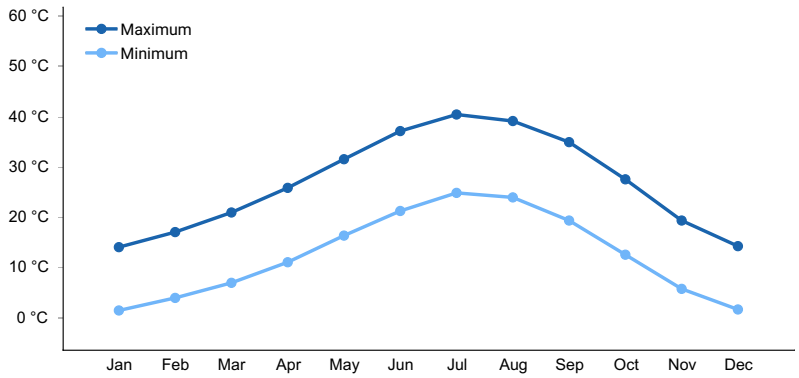


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are very deep and well drained to excessively drained. The surface soil texture is fine or very fine sand typically greater than 7 inches in depth to a soil textural change (i.e. sand to sandy loam) and/or a change in soil structure (i.e. single-grained to platy). The soil surface has a cover of less than 15 percent of small, usually rounded, pebbles (<1.2” diameter). Water intake rates are moderate to very rapid and available water capacity is very low. The soil series associated with this site include: Arada, Blacknat, Bluepoint, Filaree, Hypoint, Moapa, Prisonear, Rositas, and Tonopah.

Table 4. Representative soil features

Surface texture	(1) Loamy sand (2) Gravelly fine sand (3) Gravelly loam
Family particle size	(1) Sandy
Drainage class	Well drained to excessively drained

Permeability class	Moderate to very rapid
Soil depth	183–213 cm
Surface fragment cover <=3"	5–15%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	0.76–7.37 cm
Calcium carbonate equivalent (0-101.6cm)	0–40%
Electrical conductivity (0-101.6cm)	0–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	10–12
Soil reaction (1:1 water) (0-101.6cm)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0–57%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

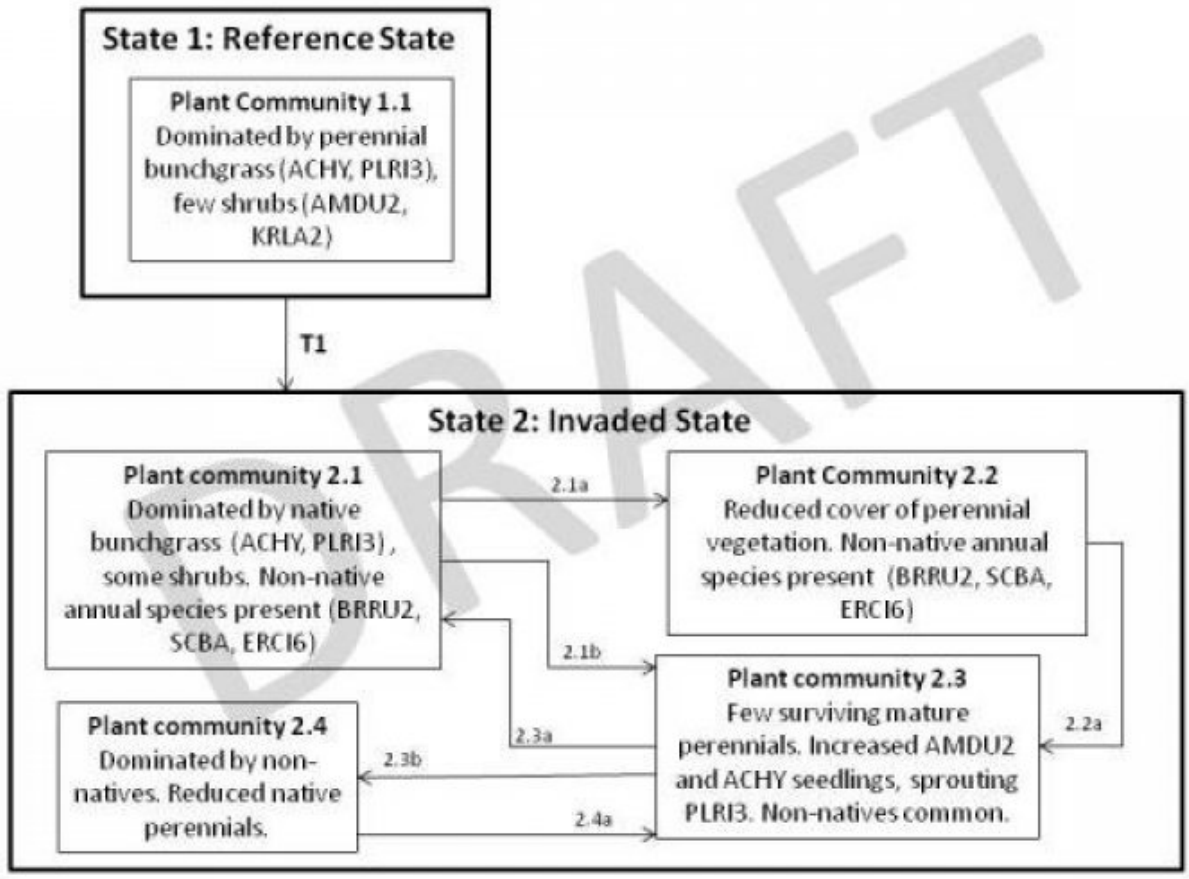
This ecological site is characterized by sandy soils which contribute to higher productivity and cover of perennial grasses. The primary organizing ecological principle is the inverse-texture hypothesis, which predicts that plant communities on coarse textured soils should have higher above-ground net primary productivity than communities on fine textured soils. Sandy or coarse textured soils have greater rates of infiltration and precipitation is percolated deeper into the soil profile. On sandy sites, the surface horizon dries out quickly and forms a barrier to the conductance and evaporation of water held in the deeper soil horizons (Lane et al. 1998). This process protects moisture from being lost to evaporation, increasing the available water in the soil profile and positively contributing to the primary productivity of these sites.

Variation in the timing and amount of rainfall is particularly important in favoring species with different physiological characteristics: there is strong relationship between summer rainfall patterns and desert grasslands (McClaran and Van Devender 1995). Perennial grass recruitment occurs from seeds, rihizomes and stolons. Rainfall and runoff is unevenly distributed across the landscape, contributing to the spatial distribution of functional and structural groups. Desert grasses are intensive exploiters, which mean the extract a large proportion of their moisture from shallow soil horizons (Burgess 1995). Intensive exploiters are very effective competitors for limited moisture and tend to be very resilient. Long-term drought greatly influences plant community dynamics. Drought induced canopy die-back and mortality, is common during periods of below average precipitation, especially among juveniles (Hamerlynck and McAuliffe 2008).

Historically, this sites would have experienced infrequent, stand replacing fires, carried by a relatively high cover of perennial grasses and shrubs (Brooks and Minnich 2006). Degree of fire damage is largely dependent on the seasonality of the burn. Damage to big galleta from fire varies. If big galleta is dry, damage may be severe. However, when plants are green, fire will tend to be less severe and damage may be minimal, with big galleta recovering quickly. Indian ricegrass can be killed by fire, depending on severity and season of burn. Indian ricegrass reestablishes on burned sites through seed dispersed from adjacent unburned areas. Sand dropseed is usually killed or topkilled by fire. Sand dropseed has the potential for postfire regeneration and seedling establishment as seeds within burned areas may remain viable. However postfire regeneration responses may differ according to relative abiotic and biotic site characteristics. Mesa dropseed is damaged by fire, but its susceptibility relative to other grasses, and its period of recovery, are poorly understood. Fire generally kills white bursage. Winterfat is either killed or top-killed by fire, depending on fire severity. Severe fire can kill the perennating buds located several inches above the ground surface and thus kills the plant. In addition, severe fire usually destroys seed on the plant. Low-severity fire scorches or only partially consumes the aboveground portions of winterfat and thus does not cause high mortality. Nevada ephedra generally sprouts after fire damages aboveground vegetation. Underground

regenerative structures commonly survive when aboveground vegetation is consumed by fire. However, severe fires may kill shallowly buried regenerative structures.

State and transition model



State 1
Reference State

This state represents the natural range of variability under pristine conditions. This state is dominated by perennial bunchgrasses and primary natural disturbance mechanisms affecting this ecological site are wildfire, long-term drought and insect attack. Timing for disturbance in combination with weather events determines plant community dynamics. This site may experience light to moderate grazing by wildlife. The additional run-in moisture helps to maintain the community phases of this state, by favoring a greater dominance by grasses with a lesser component of shrubs. This site has higher ecological resistance and resilience due to additional moisture, increased annual production and a higher amount of organic matter when compared to the surrounding sites.

Community 1.1
Reference Plant Community

The reference plant community is dominated by white bursage, big galleta, and Indian ricegrass. Sand dropseed, ephedra, and winterfat are other important species associated with this site. Potential vegetative composition is about 60% grasses, 10% forbs and 30% shrubs. Approximate ground cover (basal and crown) is 15 to 30 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	336	538	740
Shrub/Vine	168	269	370
Forb	56	90	123
Total	**560**	**897**	**1233**

Table 6. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	5-10%
Grass/grasslike basal cover	10-15%
Forb basal cover	1-5%
Non-vascular plants	0%
Biological crusts	0-1%
Litter	5-15%
Surface fragments >0.25" and <=3"	0-15%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	50-60%

State 2
Invaded

Introduced annuals such as red brome, schismus and redstem stork's bill have invaded the reference plant community and have become a dominant component of the herbaceous cover. This invasion of non-natives is attributed to a combination of factors including: 1) surface disturbances, 2) changes in the kinds of animals and their grazing patterns, 3) drought, and 4) changes in fire history. These non-natives annuals are highly flammable and promote wildfires where fires historically have been infrequent. The threshold that is crossed, is the introduction of non-native annuals that cannot be removed from the system and will alter disturbance regimes significantly from their natural or historic range of disturbances.

Community 2.1
Plant Community Phase 2.1

The plant community composition is similar to the Reference Plant Community with the presence of non-natives in the understory. Ecological function has not changed but the resilience has decreased due to the presence of non-native annuals. White bursage persists after invasion by non-native annuals, but the other shrubs and desirable grasses would either be unsuccessful in competing with the non-natives or removed from the system.

Community 2.2
Plant Community Phase 2.2

This plant community is characterized by a reduction in perennial grass cover and an increase of non-native annuals and bare ground. Heavy disturbance has decreased the perennial vegetative cover that is beneficial for soil stabilization and nutrient cycling.

Community 2.3
Plant Community Phase 2.3

This plant community is characterized by few surviving mature perennials. Disturbance tolerant shrubs and rhizomatous bunchgrasses are scattered through the plant community. Loss of mature vegetation will encourage seedling growth of burrobush and Indian ricegrass. Seed is provided by surrounding unburned areas. Non-native annuals are common throughout the site.

Community 2.4
Plant Community Phase 2.4

This plant community is characterized by the dominance of non-native annuals; perennial vegetative cover is severely reduced.

Pathway 2.1a
Community 2.1 to 2.2

Frequent and repeated disturbance such as heavy grazing, fire, or prolonged drought will decrease abundance of perennial bunchgrasses.

Pathway 2.1b
Community 2.1 to 2.3

Large fire will initially remove shrubs and depending on severity perennial grasses.

Pathway 2.2a
Community 2.2 to 2.3

A decreased level of disturbance or a year with increased precipitation will encourage a flush of vegetative growth.

Pathway 2.3a
Community 2.3 to 2.1

Controlling disturbance on this site allows perennials to mature, successfully reproduce and return to dominance.

Pathway 2.3b
Community 2.3 to 2.4

Increased fire, resulting from a continuous bed of fine fuels reduces perennial vegetative cover.

Pathway 2.4a
Community 2.4 to 2.3

Reducing the level of disturbance initiates native species regeneration.

Transition 1
State 1 to 2

Introduction of non-native species due to anthropogenic disturbance including OHV use, dry land farming, grazing, linear corridors, mining, military training operations, and settlements.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				332–628	
	big galleta	PLRI3	*Pleuraphis rigida*	224–359	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	90–224	–
	spike dropseed	SPCO4	*Sporobolus contractus*	4–27	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	4–27	–
	mesa dropseed	SPFL2	*Sporobolus flexuosus*	4–27	–
2	**Secondary Perennial grasses**			18–90	
	bush muhly	MUPO2	*Muhlenbergia porteri*	4–27	–
3	**Annual Grasses**			1–27	
	sixweeks grama	BOBA2	*Bouteloua barbata*	1–27	–
Forb					
4	**Perennial forbs**			18–72	
	milkvetch	ASTRA	*Astragalus*	4–18	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	4–18	–
5	**Annual forbs**			1–90	
Shrub/Vine					
6	**Primary shrubs**			99–296	
	burrobush	AMDU2	*Ambrosia dumosa*	45–135	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	18–72	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	18–45	–
7	**Secondary shrubs**			45–135	
	Shockley's goldenhead	ACSH	*Acamptopappus shockleyi*	9–27	–
	brittlebush	ENCEL	*Encelia*	9–27	–
	spiny hopsage	GRSP	*Grayia spinosa*	9–27	–
	creosote bush	LATR2	*Larrea tridentata*	9–27	–
	spiny menodora	MESP2	*Menodora spinescens*	9–27	–
	Mojave yucca	YUSC2	*Yucca schidigera*	9–27	–

Animal community

Livestock Interpretations:
This site is suitable for livestock grazing. Big galleta is considered a valuable forage plant for cattle and domestic sheep. Its coarse, rigid culms make it relatively resistant to heavy grazing and trampling. Indian ricegrass is highly palatable to all classes of livestock in both green and cured condition. It supplies a source of green feed before most other native grasses have produced much new growth. Sand dropseed provides fair to good forage for livestock. Sand dropseed's value as livestock forage is regional and dependent upon season. If fall rains are adequate, sand dropseed may have a period of renewed growth, producing new shoots in old sheaths. The persistent green base throughout winter makes sand dropseed an important desert winter range plant. Cattle eat mesa dropseed all year long. Use is heaviest during the summer when the plant is actively growing. Mesa dropseed becomes unpalatable and low in nutrition at maturity. White bursage is an important browse species. Browsing pressure on white bursage is particularly heavy during years of low precipitation, when production of winter annuals is low. White bursage is of intermediate forage value. It is fair to good forage for horses and fair to poor for cattle and sheep. However, because there is often little other forage where white bursage grows, it is often highly valuable to browsing animals. Winterfat is an important forage plant for livestock, especially during winter when forage is scarce. Abusive grazing practices have reduced or eliminated winterfat on some areas even though it is fairly resistant to browsing. Effects depend on severity and season of grazing. Nevada ephedra is important winter range

browse for domestic cattle, sheep and goats.

Stocking rates vary over time depending upon season of use, climate variations, site, and previous and current management goals. A safe starting stocking rate is an estimated stocking rate that is fine tuned by the client by adaptive management through the year and from year to year.

Wildlife Interpretations:
White bursage is an important browse species for wildlife. Winterfat is an important forage plant for wildlife, especially during winter when forage is scarce. Winterfat seeds are eaten by rodents and are a staple food for black-tailed jackrabbits. Mule deer and pronghorn antelope browse winterfat. Winterfat is used for cover by rodents. It is potential nesting cover for upland game birds, especially when grasses grow up through its crown. Mule deer, bighorn sheep, and pronghorn browse Nevada ephedra, especially in spring and late summer when new growth is available.

Hydrological functions

Overland flow and sediment yield diminish with increasing plant cover. Abundance of deep-rooted perennial grasses and soil surface texture increase infiltration during precipitation events. Runoff is negligible to low and water flow patterns are none to rare.

Recreational uses

Aesthetic value is derived from the diverse floral and faunal composition and the colorful flowering of wild flowers and shrubs during the spring. This site offers rewarding opportunities for photography and nature study. This site is also used for camping and hiking, especially durring the mild winters.

Other products

Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used seed as a reserve food source. Sand dropseed is an edible grass used by Native Americans. Native Americans used mesa dropseed seeds as food. White bursage is a host for sandfood, a parasitic plant with a sweet, succulent, subterranean flowerstalk. Sandfood was a valuable food supply for desert peoples. Native Americans used Nevada ephedra as a tea to treat stomach and kidney ailments.

Other information

Big galleta's clumped growth form stabilizes blowing sand. Sand dropseed is recommended as a component of grass seed mixtures for sandy and heavy to semi-sandy soils. Good results are seen reseeding dry low lands receiving less than 9 inches (230mm) of precipitation within rangelands of Nevada. Mesa dropseed is important in depleted stands of black grama. It stabilizes the loose, sandy soils giving the slower-growing black grama time to revegetate. White bursage may be used to revegetate disturbed sites in southwestern deserts. Winterfat adapts well to most site conditions, and its extensive root system stabilizes soil. However, winterfat is intolerant of flooding, excess water, and acidic soils. Nevada ephedra is useful for erosion control, and seedlings have been successfully planted onto reclaimed strip mines.

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T25S R59E S25
General legal description	This site also occurs in southern Lincoln County.

Other references

Burgess, T.L. 1995. Desert Grassland, Mixed Shrub Savanna, Shrub Steppe, or Semidesert Scrub? Pp. 31-67 in M.P. McClaran and T.R. Van Devender (eds.), The Desert Grassland. University of Arizona Press, Tucson Arizona.

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Hamerlynck, E.P. and J.R. McAuliffe. 2008. Soil-dependent canopy die-back and plant mortality in two Mojave Desert shrubs. J. of Arid Environments. 72:1793-1802.

McClaran, M.P. and T.R. VanDevender, eds. 1995. The Desert Grassland. University of Arizona Press. Tucson, Arizona.

USDA-NRCS Plants Database (Online; http://www.plants.usda.gov).

Contributors

GKB/HA

Approval

Kendra Moseley, 3/11/2025

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	P NOVAK-ECHENIQUE
Contact for lead author	State Rangeland Management Specialist
Date	02/23/2010
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are none.

2. **Presence of water flow patterns:** Water flow patterns none to rare.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare with occurrence typically limited to areas affected by wind scouring.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground to 50% to 60%.

5. **Number of gullies and erosion associated with gullies:** Gullies are none.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None to slight. If observed, wind scour spots are isolated and of small extent.

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7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage from grasses and annual & perennial forbs) expected to move distance of slope length during intense summer storms. Persistent litter (large woody material) will remain in place except during catastrophic events.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability values should be 1 to 4 on the sandy soil textures found on this site. (To be field tested.)

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically single grain or thin to medium platy. Soil surface colors are light and soils are typified by an ochric epipedon. Organic carbon of the surface 2 to 3 inches is typically less than 1 percent dropping off quickly below. Organic matter content can be more or less depending on micro-topography.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Reference Plant Community: Perennial herbaceous plants (especially deep-rooted bunchgrasses [i.e., Indian ricegrass and big galleta] slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact.

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

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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: Reference Plant Community: Deep-rooted, warm season, perennial bunchgrasses

    Sub-dominant: Mojave desert shrubs >> deep-rooted, cool season, perennial bunchgrasses >> perennial forbs = annual forbs = shallow-rooted, perennial, grasses

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs common and standing dead shrub canopy material may be as much as 25% of total woody canopy; some of the mature bunchgrasses (<20%) have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Between plant interspaces 5-15% and depth of litter is ±¼ inch.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season ±800 lbs/ac.

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

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17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years.
