USDA Natural Resources
Conservation Service

Ecological site R030XB026NV
GYPSIC LOAM 3-5 P.Z.

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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.

Ecological site concept

This site occurs on pediments, hills, and fan remnants on all exposures. Slopes range from 0 to 50 percent, but slope gradients of 15 to 30 percent are most typical. Elevations are 1200 to 3000 feet. These soils are formed in residuum derived from gypsiferous sandstone and siltstone.

This site is part of group concept R030XB118NV.

Associated sites

R030XB019NV	**Eroded Fan Remnant Pavette 4-6 P.Z.**

Similar sites

R030XB117NV	**GYPSIC SAND 3-5 P.Z.** ACGR and ATCA2 important shrubs; more productive site
R030XB079NV	**GYPSIC SLOPE 3-5 P.Z.** ATHY-SUAED codominant shrubs
R030XA060NV	**GYPSIC LOAM 3-5 P.Z.** ATHY-SUAED codominant shrubs
R030XB109NV	**GYPSIC BARREN 3-5 P.Z.** ATHY absent

Table 1. Dominant plant species

Tree	Not specified

Shrub	(1) *Psorothamnus fremontii* (2) *Atriplex hymenelytra*
Herbaceous	Not specified

Physiographic features

This site occurs on pediments, hills, and fan remnants on all exposures. Slopes range from 0 to 50 percent, but slope gradients of 15 to 30 percent are most typical. Elevations are 1200 to 3000 feet.

Table 2. Representative physiographic features

Landforms	(1) Pediment (2) Hill (3) Fan remnant
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Rare
Ponding frequency	None
Elevation	366–914 m
Slope	0–50%
Water table depth	145 cm
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 30 percent of the annual precipitation. Average annual precipitation is 3 to 5 inches. Mean annual air temperature is 69 to 73 degrees F. The average growing season is about 170 to 340 days.

Table 3. Representative climatic features

Frost-free period (average)	340 days
Freeze-free period (average)	
Precipitation total (average)	127 mm

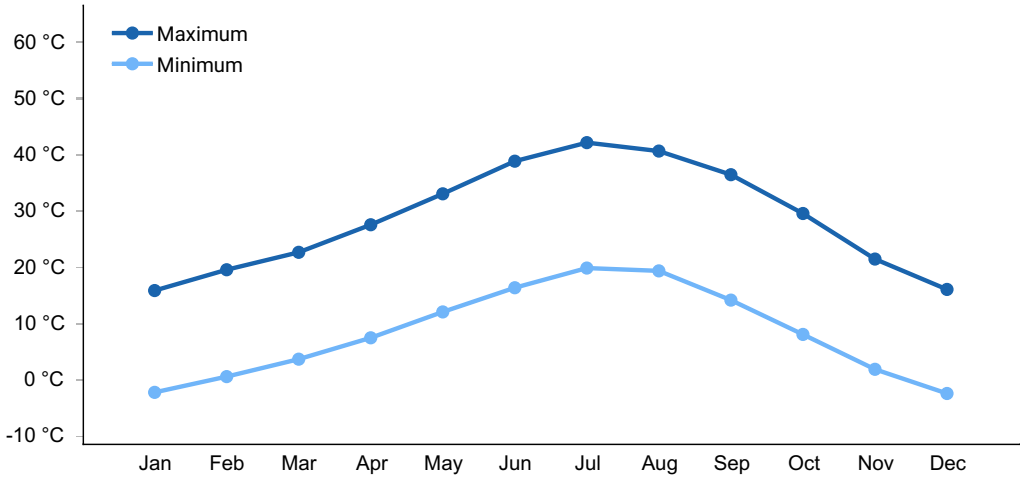


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are shallow to very deep and moderately well drained to well drained. These soils are formed in residuum derived from gypsiferous sandstone and siltstone. Soil surface textures are fine sandy loams to silty clay loams. Water intake rates are slow to moderately rapid and runoff is high. These soils have a gypsic horizon. The soil series associated with this site include: Callville, Limewash, and Spring.

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone
Surface texture	(1) Very gravelly fine sandy loam (2) Silty clay loam (3) Extremely gravelly fine sandy loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately rapid
Soil depth	36–213 cm
Surface fragment cover <=3"	45–65%
Surface fragment cover >3"	5–10%
Available water capacity (0-101.6cm)	4.06–6.86 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%

Electrical conductivity (0-101.6cm)	0–32 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–30
Soil reaction (1:1 water) (0-101.6cm)	6.6–9
Subsurface fragment volume <=3" (Depth not specified)	16–70%
Subsurface fragment volume >3" (Depth not specified)	0–22%

Ecological dynamics

Gypsic soils are generally weakly aggregated which can result in serious erosion. The severity of the erosion is dependent on the gypsum content (FAO 1990). Gypsiferous soils are generally structureless, low in organic matter, and may become unstable in water making them a poor medium for plant growth. Gypsic horizons, however, can also be strongly aggregated and form hard crusts that control erosion and sometimes impede the downward movement of water and extension of roots (FAO 1990). The continuous petrogypsic horizon plays a significant role in plant community dynamics by increasing the available water holding capacity of the soil. These soils are high in sodium and have approximately 50% ground cover of microbiotic crusts

Microtopography created by crusts can form microcatchments for water, positively influencing soil moisture and causing suspended sediment to settle out. Interactions between microboitic crusts and vascular plants are complex. They can be mutualistic, competitive, or neutral (Williams 1994). Soil crusts can encourage seedling establishment and survival, due to increased water holding capacity and availability of macronutrients (Belnap 1995). Crusts can also act as a competitor. Seeds may require morphological adaptations in order to penetrate and establish in well developed microbiotic crusts (Williams 1994). This relationship will help keep non-natives out of the system, under undisturbed conditions, while native plants will thrive because they have evolutionary adaptations to persist in this environment.

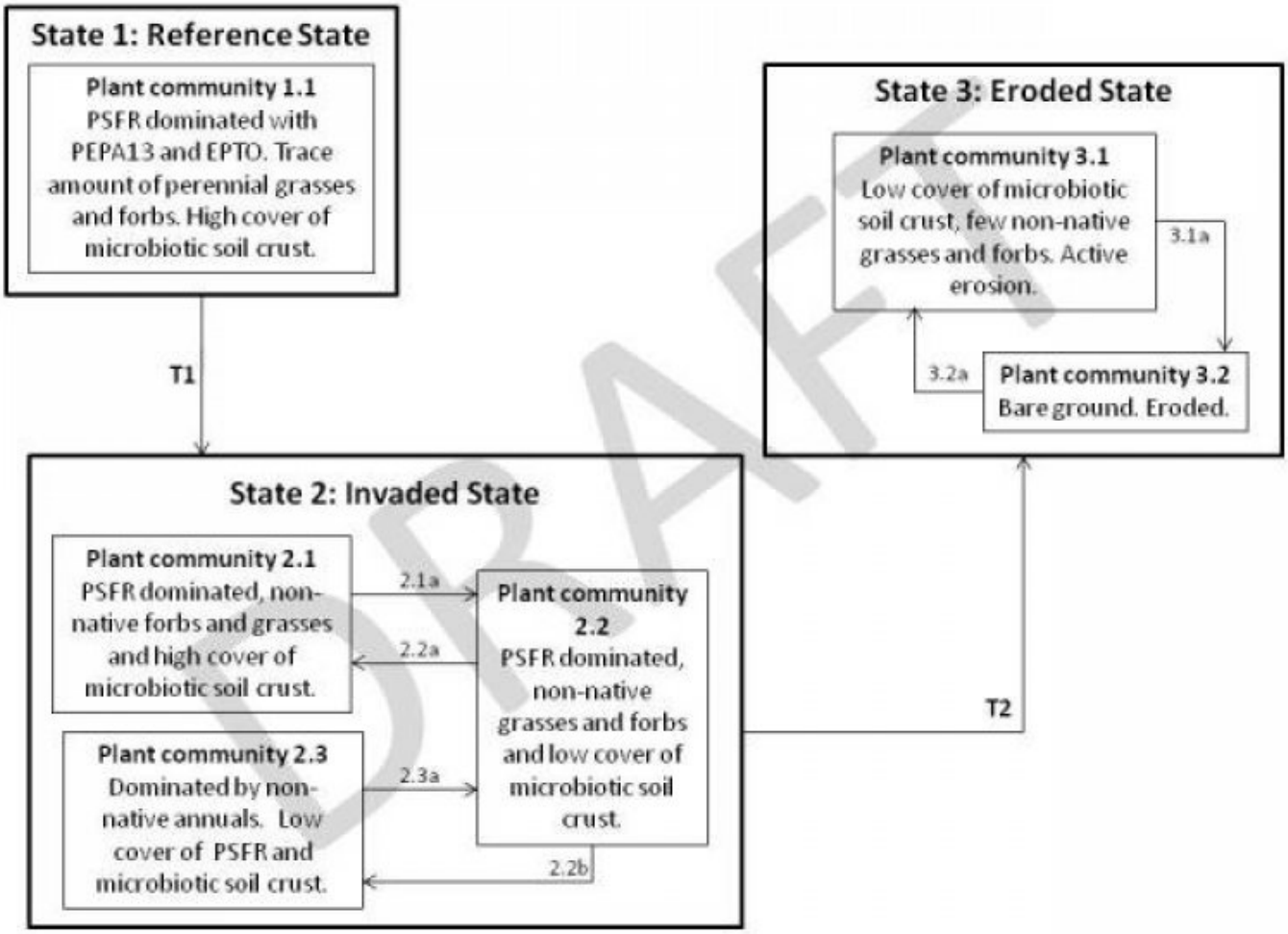
The potential native plant community is dominated by gypsum tolerant species including shadscale saltbush, Parry’s sandpaper plant, and Fremont dalea. Shadscale saltbush is tolerant of arid conditions, is a facultative halophyte, and does not require large amounts of nitrogen. Shadscale is evergreen to partly deciduous and has a densely clumped to rounded growth form (Simonin 2001). Shadscale is not tolerant of prolonged periods of drought or extended periods of increased soil moisture and either will result in mortality. Parry’s sandpaper plant is an evergreen shrub with rough-pubescent foliage. Fremont dalea is a nitrogen-fixing legume.

As ecological condition deteriorates, creosotebush and desert holly increase. Species

likely to invade this site are annuals such as red brome and red-stem filaree.

Fire Ecology:
Fires in Mojave Desert scrub were an infrequent event in pre-settlement desert habitats, because fine fuels from winter annual plants were probably sparse, only occurring in large amounts during exceptionally wet winters. Creosotebush is poorly adapted to fire because of its limited sprouting ability. Creosotebush survives some fires that burn patchily or are of low severity. Most species of Atriplex are highly tolerant of fire, thus desert holly may resprout. Ephedra typically resprouts from the crown after fire.

State and transition model



State 1
Reference State

The Reference State is characterized by a shrub dominated plant community and a high cover of microbiotic soil crust. Historically, this state experienced an extended fire return interval, which resulted in long-lived stable plant communities. These communities were sparsely vegetated, therefore soil stability was primarily provided by microbiotic soil crust.

Community 1.1
Reference Plant Community

The reference plant community is dominated by Fremont dalea, desert holly, Parry sandpaper plant, and creosotebush. Torrey ephedra and California bearpoppy are other important species associated with this site. Potential vegetative composition is about 95% shrubs and 5 to 10% native forbs and grasses. Approximate ground cover (basal and crown) is less than 5 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	10	50	101
Forb	–	2	6
Grass/Grasslike	1	3	6
Total	**11**	**55**	**113**

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. PSFR and ATHY would persist after invasion by non-native annuals, but other shrubs and desirable grasses may be unsuccessful in competing with the non-natives can can potenialy be removed from the system. A biotic threshold has been crossed with the introduction of non-native annuals that cannot be removed from the system. Ecological resiliency has been reduced by the presence of non-native annual species that have the potential to alter disturbance regimes significantly from their natural or historic range of variability.

Community 2.1
Plant Community Phase 2.1

This plant community is similar to the Reference Plant Community. In the absence of disturbance ecological processes of this plant community have not been compromised by the presence of non-native species. PSFR and ATHY would persist 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 continued disturbance following invasion. Any disturbance that causes soil trampling will remove microbiotic soil crust decreasing the stability of the site and facilitate the increase of invasive species.

Community 2.3
Plant Community Phase 2.3

This plant community is characterized by a short disturbance return interval. The soil surface is continually disturbed decreasing the cover of microbiotic crusts. Non-native annuals take advantage of the increased available resources. This plant community is identified as “at risk”. The loss of microbiotic soil crust and vegetative cover has reduced the ecological resistance and resilience. Without a change in management this plant community will cross a threshold.

Pathway 2.1a
Community 2.1 to 2.2

Anthropogenic disturbances disturb microbiotic soil crust reducing stability of the site.

Pathway 2.2a
Community 2.2 to 2.1

Removal of surface disturbance over the long term allows microbiotic crust to recover.

Pathway 2.2b
Community 2.2 to 2.3

Continued disturbance removes Fremont’s dalea and other shrubby vegetation. Non-native annuals increase and microbiotic crusts are unable to recover.

Pathway 2.3a
Community 2.3 to 2.2

With time Fremont’s dalea reestablishes from seed.

State 3
Eroded State

The Eroded State is characterized by a reduction in soil stabilization do to a loss of vegetative cover and microbiotic soil crust. A biotic threshold has been crossed, with the loss of long-lived native vegetation, leading to active soil erosion.This state is

characterized by a new ecological equilibrium, one that includes reduced nutrient cycling and infiltration.

Community 3.1
Plant Community Phase 3.1

Vegetation is dominated by non-native annuals. Soil stability on the site is severely reduced. Active erosion easily occurs, even during typical rainfall events.

Community 3.2
Plant Community Phase 3.2

Total loss of vegetation and soil crust. Gullies and rills are common to severe. Ecological processes have been greatly altered.

Pathway 3.1a
Community 3.1 to 3.2

Continued disturbance or large rainfall event increases the level of erosion.

Pathway 3.2a
Community 3.2 to 3.1

Non-native annuals germinate and establish even on a severely eroded site.

Transition 1
State 1 to 2

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

Transition 2
State 2 to 3

Severe and continuous disturbance or long term drought decreases microbiotic soil crust and vegetative cover.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Perennial grasses**			1–3	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–1	–
	threeawn	ARIST	*Aristida*	0–1	–
	big galleta	PLRI3	*Pleuraphis rigida*	0–1	–
2	**Annual grasses**			1–3	
Forb					
3	**Perennial forbs**			1–4	
	California bearpoppy	ARCA4	*Arctomecon californica*	0–1	–
	Arizona honeysweet	TIOB	*Tidestromia oblongifolia*	0–1	–
4	**Annual forbs**			1–3	
Shrub/Vine					
5	**Primary shrubs**			22–45	
	Fremont's dalea	PSFR	*Psorothamnus fremontii*	11–20	–
	desertholly	ATHY	*Atriplex hymenelytra*	6–11	–
	Parry's sandpaper plant	PEPA13	*Petalonyx parryi*	3–9	–
	creosote bush	LATR2	*Larrea tridentata*	1–6	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	1–3	–
6	**Secondary shrubs**			3–9	
	catclaw acacia	ACGR	*Acacia greggii*	1–2	–
	burrobush	AMDU2	*Ambrosia dumosa*	1–2	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	1–2	–
	brittlebush	ENFA	*Encelia farinosa*	1–2	–
	Virgin River brittlebush	ENVI	*Encelia virginensis*	1–2	–
	desert pepperweed	LEFR2	*Lepidium fremontii*	1–2	–
	water jacket	LYAN	*Lycium andersonii*	1–2	–

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing, due to the low forage production. Fremont's dalea is of little importance to livestock due to its low palatability. Many animals bed in or under creosotebush. Domestic sheep dig shallow beds under creosotebush because it provides the only shade in the desert scrub community. Creosotebush is unpalatable to livestock. Consumption of creosotebush may be fatal to sheep. Torrey’s ephedra is important winter forage for cattle and sheep. Torrey’s ephedra is moderately palatable to all domestic livestock especially as winter browse.

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:
Fremont's dalea has low palatability to many wildlife species. Many small mammals browse creosotebush or consume its seeds. Desert reptiles and amphibians use creosotebush as a food source and perch site and hibernate or estivate in burrows under creosotebush, avoiding predators and excessive daytime temperatures. Torrey’s ephedra is an important browse species for big game. Torrey’s ephedra is moderately palatable to many big game species, especially as winter browse.

Hydrological functions

Runoff is high. Permeability is moderately rapid. Hydrologic soil groups are C and D.

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 and early summer. This site offers rewarding opportunities to photographers and for nature study.

Other products

Creosotebush has been highly valued for its medicinal properties by desert peoples. It has been used to treat at least 14 illnesses. Twigs and leaves may be boiled as tea, steamed, pounded into a powder, pressed into a poultice, or heated into an infusion.

Other information

Creosotebush may be used to rehabilitate disturbed environments in southwestern deserts. Once established, creosotebush may improve sites for annuals that grow under its canopy by trapping fine soil, organic matter, and symbiont propagules. It may also increase water infiltration and storage.

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T20S R64E S6
UTM zone	N
UTM northing	4012560
UTM easting	690951
Latitude	36° 14′ 20″
Longitude	114° 52′ 30″
General legal description	About 8 miles east of Las Vegas, near PABCO wallboard plant, Clark County, Nevada. This site also occurs in southern Lincoln county.

Other references

Fire Effects Information System (Online; http://www.fs.fed.us/database/feis/plants/).

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

Contributors

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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	03/08/2010
Approved by	Kendra Moseley

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

Indicators

1. **Number and extent of rills:** Rills are rare, but may be evident in areas recently subjected to summer convection storms.

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2. **Presence of water flow patterns:** Water flow patterns are rare. A few waterflow patterns may be evident in areas recently subjected to summer convection storms. Where flow patterns are observed, they are short in length and stable.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare with occurrence typically limited to areas within water flow patterns.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground 20-30%; surface rock fragments to 75%; shrub canopy to 5%; basal area for perennial herbaceous plants trace.

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5. **Number of gullies and erosion associated with gullies:** None

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None

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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 convection storms or rapid snowmelt events. 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 3 on the coarse 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 soil structure is typically medium to very thick platy. Soil surface colors are light and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is less than 3.4 percent. (lab characterization data)

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Sparse shrub canopy and associated litter break raindrop impact. Medium to fine textured surface soils have moderately rapid infiltration.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Platy or massive sub-surface horizons or gypsic horizons are not to be interpreted as compacted layers.

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

    Dominant: Mojave Desert shrubs

    Sub-dominant: perennial bunchgrasses = deep-rooted, perennial forbs > annual forbs

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs common and standing dead shrub canopy material may be as much as 25% of total woody canopy; mature bunchgrasses commonly (±15%) have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Between plant interspaces (Trace).

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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 ±50lbs/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 annuals such as red brome, filaree and Mediterranean grass.

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17. **Perennial plant reproductive capability:** All functional groups should reproduce in average growing season years.
