

Ecological site R030XB046CA Outwash Plain

Last updated: 2/24/2025
Accessed: 05/11/2025

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.

MLRA notes

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

The Mojave Desert Major Land Resource Area (MLRA 30) 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 Mojave Desert is a transitional area between hot deserts and cold deserts where close proximity of these desert types exert enough influence on each other to distinguish these desert types from the hot and cold deserts beyond the Mojave. Kottek et. al 2006 defines hot deserts as areas where mean annual air temperatures are above 64 F (18 C) and cold deserts as areas where mean annual air temperatures are below 64 F (18 C). Steep elevation gradients within the Mojave create islands of low elevation hot desert areas surrounded by islands of high elevation cold desert areas.

The Mojave Desert receives less than 10 inches of mean annual precipitation. Mojave Desert low elevation areas are often hyper-arid while high elevation cold deserts are often semi-arid with the majority of the Mojave being an arid climate. Hyper-arid areas receive less than 4 inches of mean annual precipitation and semi-arid areas receive more than 8 inches of precipitation (Salem 1989). The western Mojave receives very little precipitation during the summer months while the eastern Mojave experiences some summer monsoonal activity.

In summary, the Mojave is a land of extremes. Elevation gradients contribute to extremely hot and dry summers and cold moist winters where temperature highs and lows can fluctuate greatly between day and night, from day to day and from winter to summer. Precipitation falls more consistently at higher elevations while lower elevations can experience long intervals without any precipitation. Lower elevations also experience a low frequency of precipitation events so that the majority of annual precipitation may come in only a couple precipitation events during the whole year. Hot desert areas influence cold desert areas by increasing the extreme highs and shortening the length of below freezing events. Cold desert areas influence hot desert areas by increasing the extreme lows and increasing the length of below freezing events. Average precipitation and temperature values contribute little understanding to the extremes which govern wildland plant communities across the Mojave.

Arid Eastern Mojave Land Resource Unit (XB)

LRU notes

The Mojave Desert is currently divided into 4 Land Resource Units (LRUs). This ecological site is within the Arid Eastern Mojave LRU where precipitation is bi-modal, occurring during the winter months and summer months. The Arid Eastern Mojave LRU is designated by the 'XB' symbol within the ecological site ID. This LRU is found across the eastern half of California, much of the mid-elevations of Nevada, the southernmost portions of western Utah, and the mid-elevations of northwestern Arizona. This LRU is essentially equivalent to the Eastern Mojave Basins and Eastern Mojave Low Ranges and Arid Footslopes of EPA Level IV Ecoregions

Elevations range from 1650 to 4000 feet and precipitation is between 4 to 8 inches per year. This LRU is

distinguished from the Arid Western Mojave (XA) by the summer precipitation, falling between July and September, which tends to support more warm season plant species. The 'XB' LRU is generally east of the Mojave River and the 117 W meridian (Hereford et. al 2004). Vegetation includes creosote bush, burrobush, Nevada jointfir, ratany, Mojave yucca, Joshua tree, cacti, big galleta grass and several other warm season grasses. At the upper portions of the LRU, plant production and diversity are greater and blackbrush is a common dominant shrub.

Ecological site concept

This site occurs on lake plains, alluvial flats or relict alluvial flats below 3600 feet where ponding for any length of time is unlikely. High elevation mountains are not within the watershed of this ecological site so that headwaters are also below 3600 feet.

This is a group concept and provisional STM that also covers R030XB046NV, R030XY046NV.

Associated sites

R030XB004NV	SANDY 5-7 P.Z.
R030XB005NV	Arid Active Alluvial Fans
R030XY047NV	ALLUVIAL PLAIN

Similar sites

R030XY047NV	ALLUVIAL PLAIN AMDU2 and LATR2 minor shrubs
R030XB065NV	SODIC SAND More productive site; PLRI3 dominant plant
R030XB050NV	Calcic Dry Wash Less productive site; occurs within, and immediately adjacent, to active floodplain of ephemeral stream channels
R030XY046NV	OUTWASH PLAIN This is the same ecological site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Atriplex polycarpa</i> (2) <i>Larrea tridentata</i>
Herbaceous	Not specified

Physiographic features

This site occurs on alluvial flats and lake plains. Slopes range from 0 to 8 percent, but slope gradients of 0 to 4 percent are typical. Elevations are 1000 to 4500 feet.

Table 2. Representative physiographic features

Landforms	(1) Alluvial flat (2) Lake plain
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Rare
Ponding frequency	None
Elevation	1,000–4,500 ft
Slope	0–8%

Aspect	Aspect is not a significant factor
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Climatic features

The climate is arid characterized by mild winters and very hot dry summers. Precipitation is greatest in the winter with a lesser secondary peak in summer, typical of the Mojave Desert. Average annual precipitation is 3 to about 7 inches. Mean annual air temperature is 56 to over 70 degrees F. The average growing season is about 190 to 330 days.

Table 3. Representative climatic features

Frost-free period (average)	330 days
Freeze-free period (average)	
Precipitation total (average)	7 in

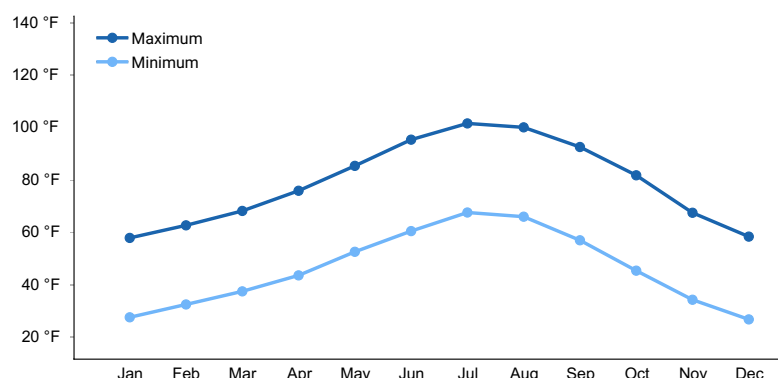


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are deep alluvium derived from mixed sources. Available water capacity is low to high, runoff is negligible to medium, and the soils are well drained to somewhat excessively drained. The soils series associated with this site include Corbilt, Corncreek, Glendale, Grapevine, Haymont, Hypoint, Nopah, and Tipnat. The soils have a typic-aridic soil moisture regime. Soil reaction is moderately to very strongly alkaline.

Table 4. Representative soil features

Surface texture	(1) Gravelly fine sandy loam (2) Loamy fine sand (3) Very gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to rapid
Soil depth	72–84 in
Surface fragment cover ≤3"	0–50%
Surface fragment cover >3"	0–2%
Available water capacity (0–40in)	3.36–10.33 in

Calcium carbonate equivalent (0-40in)	1–20%
Electrical conductivity (0-40in)	0–32 mmhos/cm
Sodium adsorption ratio (0-40in)	0–45
Soil reaction (1:1 water) (0-40in)	8.4–9.2
Subsurface fragment volume <=3" (Depth not specified)	2–30%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

The plant communities of this site are dynamic in response to changes in disturbance regimes and weather patterns. Community phase changes are primarily driven by long term drought. Historically wildfire was infrequent and patchy, due to widely spaced vegetation and low herbaceous production.

Cattle saltbush flowers from May to August, with fruit ripening from October to December. Seeds are dispersed from November to May. Cattle saltbush is tolerant of alkaline conditions and relatively high pH, however, germination can be reduced if salt concentrations become too high. Large quantities of salt are accumulated in the shoots and on the leaf surface, this is thought to increase its salinity tolerance by reducing the salinity stress of photosynthetically active tissue (Kay et al. 1977).

Cattle saltbush and all *Atriplex* species are well adapted to the Mojave Desert environment. They are examples of extreme drought resistance, surviving more than a week at -6 Megapascals of water potential. The spatial distribution of vegetation of this site impacts runoff, infiltration, sediment redistribution and nutrient cycling. Patches of vegetation increase fine sediment deposition and reduce runoff producing positive feedback dynamics in the plant community. Shrub canopies shield the soil from radiation and rainfall (Puigdefabregas 2005). Shrubs partition the rainfall into interception, throughfall and stem flow. Interception diminishes net rainfall, while stemflow concentrates the water and results in deeper infiltration (Puigdefabregas 2005).

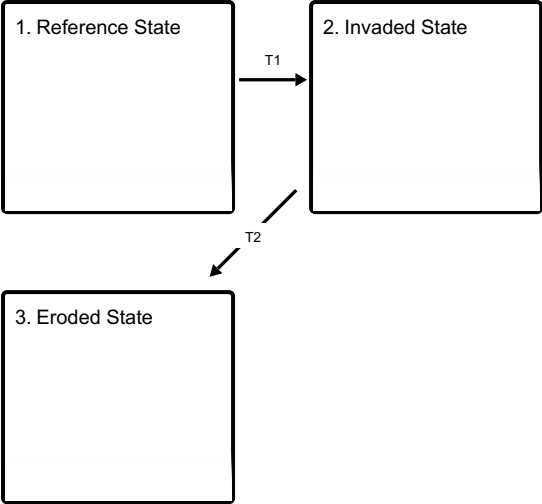
Fire Ecology:

The historic mean fire return interval for salt-desert shrub communities ranged from 35 to 100 years. Fires were not historically important in salt-desert shrublands where grasses were not abundant. However, frequent fires fueled by exotic annuals are now common in salt-desert shrublands. Cattle saltbush is most common under regimes of infrequent fire and moderate browsing. Fire top-kills or kills fourwing saltbush, depending upon ecotype. Fourwing saltbush may sprout after top-kill.

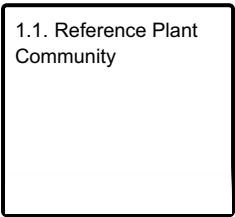
Fire kills many creosotebush. Creosotebush is poorly adapted to fire because of its limited sprouting ability. Creosotebush survives some fires that burn patchily or are of low severity. Indian ricegrass can be killed by fire, depending on severity and season of burn. Indian ricegrass reestablishes on burned sites through seed dispersed from adjacent unburned areas.

State and transition model

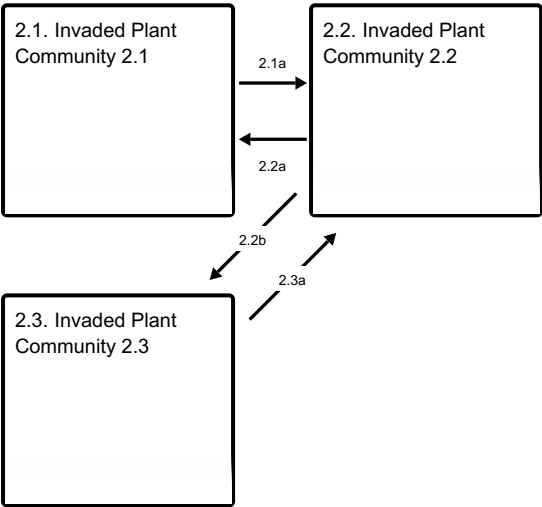
Ecosystem states



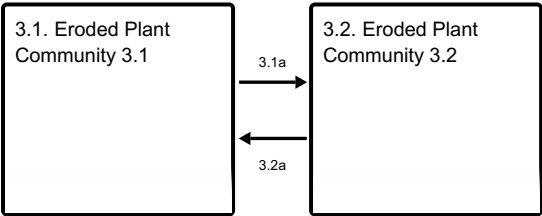
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference State

The Reference State is representative of the natural range of variability under pristine conditions. The plant community is shrub dominated with few perennial grasses and forbs. Historically, this state experienced an extended fire return interval, which resulted in long-lived stable saltbush plant communities. These communities were sparsely vegetated and soil stability was primarily provided by surface rock fragments and microbiotic soil crust.

Community 1.1

Reference Plant Community

The representative plant community is dominated by cattle saltbush, white bursage, and creosotebush. Potential vegetative composition is about 10 percent perennial grasses and 10 percent annual and perennial forbs and 80 percent shrubs. Approximate ground cover (basal and crown) is 10 percent. This plant community is representative of a late-seral healthy condition.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	120	240	320
Grass/Grasslike	15	30	40
Forb	15	30	40
Total	150	300	400

State 2

Invaded State

The Invaded State is characterized by the presence of non-native annuals in the understory. Introduced annuals such as red brome, Mediterranean grass and redstem filaree have invaded the reference plant community. These non-natives annuals are highly flammable and promote wildfires where fires historically have been infrequent. A biotic threshold has been crossed, with the introduction of non-natives that are difficult to remove from the system and have the potential to significantly alter disturbance regimes from their natural or historic range of variability.

Community 2.1

Invaded Plant Community 2.1

This plant community is similar to the reference plant community with a trace of non-natives in the understory. Ecological processes have been not compromised by the presence of non-native species at this time, however, ecological resilience is reduced. Creosotebush and cattle saltbush persist through invasion by non-native annuals, however, native forbs and grasses are at a competitive disadvantage and suffer reduced vigor and reproductive capacity.

Community 2.2

Invaded Plant Community 2.2

This plant community is characterized reduced perennial vegetative cover and increased non-native biomass. Ecological resilience is severely reduced. Management should be focused on reducing disturbance and protecting native perennial vegetation to ensure a seed source in the future.

Community 2.3

Invaded Plant Community 2.3

This plant community is characterized by a short disturbance return interval. The soil surface is continually disturbed decreasing stability and increasing erosion. Non-native annuals take advantage of the increased availability of resources. This plant community is identified as “at risk”. The loss of vegetative cover has reduced the ecological resistance and resilience. A change in management is needed to prevent this plant community from crossing an irreversible threshold.

Pathway 2.1a

Community 2.1 to 2.2

Further anthropogenic disturbance removes shrubs and microbiotic soil crust reducing soil stability.

Pathway 2.2a

Community 2.2 to 2.1

Changes in management with time, allows woody perennials to recover, contributing to increased ecological resilience.

Pathway 2.2b

Community 2.2 to 2.3

Continued disturbance removes cattle saltbush and other shrubby vegetation. Non-native annuals increase.

Pathway 2.3a

Community 2.3 to 2.2

Changes in management to remove disturbance and over time the shrubby vegetation will re-establish.

State 3

Eroded State

The Eroded State is characterized by a reduction in soil stabilization. Prolonged soil surface disturbance has caused this site to cross an abiotic threshold. The loss of vegetation and soil crust has decreased the stability of the site. Site function is controlled by soil erosion, wind and soil temperature.

Community 3.1

Eroded Plant Community 3.1

Vegetation is dominated by non-native annuals. Soil stability is severely reduced and active erosion easily occurs, even during typical rainfall events.

Community 3.2

Eroded Plant Community 3.2

This plant community is characterized by a total loss of vegetation and soil crust.

Pathway 3.1a

Community 3.1 to 3.2

Continued surface disturbance.

Pathway 3.2a

Community 3.2 to 3.1

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

Transition T1

State 1 to 2

Introduction of non-natives is attributed to a combination of factors including 1) surface disturbances (anthropogenic), 2) changes in the kinds of animals and their grazing patterns, 3) drought, and 4) changes in fire history.

Transition T2

State 2 to 3

Continued soil surface disturbance, loss of perennial vegetation and soil crust.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Perennial Cool Season Bunchgrass (Mid = 1-3')			4–14	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	2–8	–
	desert needlegrass	ACSP12	<i>Achnatherum speciosum</i>	2–6	
2	Perennial Warm Season Bunchgrass (Mid 1-3')			2–8	
	threeawn	ARIST	<i>Aristida</i>	2–8	–
3	Perennial Warm Season Bunchgrass (Short < 1')			2–8	
4	Annual			0–9	
Forb					
5	Perennial			6–24	
	desert globemallow	SPAM2	<i>Sphaeralcea ambigua</i>	6–24	–
6	Annual			0–10	
	spineflower	CHORI2	<i>Chorizanthe</i>	1–10	–
	desert trumpet	ERIN4	<i>Eriogonum inflatum</i>	1–10	–
Shrub/Vine					
7	Primary Shrubs			135–300	
	cattle saltbush	ATPO	<i>Atriplex polycarpa</i>	75–135	
	creosote bush	LATR2	<i>Larrea tridentata</i>	15–60	–
	burrobush	AMDU2	<i>Ambrosia dumosa</i>	30–60	–
8	Secondary Shrubs			15–45	
	jointfir	EPHED	<i>Ephedra</i>	3–15	–
	desert-thorn	LYCIU	<i>Lycium</i>	3–15	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	3–15	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	3–15	–
	desertholly	ATHY	<i>Atriplex hymenelytra</i>	3–15	–

Animal community

Livestock Interpretations:

This site is poorly suited to livestock grazing because of low forage production. Grazing management should be keyed to Indian ricegrass and cattle saltbush. Indian ricegrass has good forage value for domestic sheep, cattle and horses. It supplies a source of green feed before most other native grasses have produced much new growth. Cattle saltbush is one of the most palatable shrubs in the West. Its protein, fat, and carbohydrate levels are comparable to alfalfa. It provides nutritious forage for all classes of livestock. Palatability is rated as good for domestic sheep and domestic goats; fair for cattle; fair to good for horses in winter, poor for horses in other seasons.

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.

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.

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:

Cattle saltbush provides valuable habitat and year-round browse for wildlife. Cattle saltbush also provides browse and shelter for small mammals. Additionally, the browse provides a source of water for black-tailed jackrabbits in arid environments. Granivorous birds consume the fruits. Wild ungulates, rodent and lagomorphs readily consume all aboveground portions of the plant. White bursage is an important browse species for wildlife.

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.

Hydrological functions

Runoff is negligible to medium and permeability is moderately slow to rapid. Sparse shrub canopy and associated litter break provide some protection from raindrop impact. Water flow patterns are rare to common depending on site location relative to major inflow areas from higher landscape positions.

Other products

Indian ricegrass was traditionally eaten by some Native American peoples. The Paiutes used seed as a reserve food source.

White bursage is a host for sandfood, a parasitic plant with a sweet, succulent, subterranean flowerstalk. Sandfood was a valuable food supply for Native Americans.

Creosotebush has been highly valued for its medicinal properties by Native Americans. Twigs and leaves may be boiled as tea, steamed, pounded into a powder, pressed into a poultice, or heated into an infusion.

Other information

Indian ricegrass is well-suited for surface erosion control and desert revegetation although it is not highly effective in controlling sand movement.

White bursage may be used to revegetate disturbed sites in southwestern deserts.

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 symbiotic propagules. It may also increase water infiltration and storage.

Other references

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

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Puigdefabregas, J. 2005. The role of vegetation patterns in structuring runoff and sediment fluxes in drylands. *Earth Surface Processes and Landforms*. 30:133-147.

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Contributors

Approval

Sarah Quistberg, 2/24/2025

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	10/19/2011
Approved by	Sarah Quistberg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None

2. **Presence of water flow patterns:** Water flow patterns are rare to common depending on site location relative to major inflow areas from higher landscape positions.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare with occurrence typically limited to areas within water flow patterns.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground up to 85%

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

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

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. Persistent litter (large woody material) will remain in place except during large rainfall 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 most 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):** Structure of soil surface will be medium platy or massive. Soil surface colors are pale brown or light gray and soils typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is less than 1 percent.
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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 provide some protection from 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):** Compacted layers are none. Massive sub-surface horizons, subsoil calcic 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: Tall shrubs (cattle saltbush & creosotebush)
- Sub-dominant: associated low-statured, shrubs (white bursage, shadscale) >> deep-rooted, cool season, perennial bunchgrasses > perennial forbs = annual forbs > shallow-rooted, perennial bunchgrasses.
- Other: Warm season bunchgrasses
- Additional:
-
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 30% of total woody canopy; mature bunchgrasses commonly (<20%) have dead centers.
-
14. **Average percent litter cover (%) and depth (in):** Between plant interspaces and under canopy 5-10%, depth 0.25 inches
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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 \pm 300 lbs/ac; favorable 400 lbs/ac, unfavorable 150 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: Potential invaders include red brome, Mediterranean grass, annual mustards, Russian thistle, and redstem filaree.

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