USDA Natural Resources
Conservation Service

Ecological site R030XA009CA
Alkali Flat 5-7

Last updated: 10/21/2024
Accessed: 11/21/2024

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 Western Mojave Land Resource Unit (XA)

LRU notes

The Mojave Desert is currently divided into 4 Land Resource Units (LRUs). This ecological site is within the arid portions of the Mojave where precipitation primarily occurs during the winter months (Hereford et. al 2004). The lack of summer precipitation as well as cooler temperatures allows cool season species to occupy sites at lower elevations than they do in the Eastern Mojave. For example, sandberg bluegrass, winterfat and spiny hopsage are common at lower elevations in the Western Mojave than they are in the Eastern Mojave. Warm season species like big galleta rarely occur in the Western Mojave. The Arid Western Mojave LRU is designated by the 'XA' symbol within the ecological site ID and is roughly equivalent to Western Mojave Basins and Western Mojave Low Ranges and Arid Footslopes of EPA Level IV Ecoregions.

Elevations range from 1650 to 4300 feet and precipitation is between 4 to 8 inches per year. The Arid Western Mojave LRU is distinguished from the Arid Eastern Mojave (XB) by the lack of summer precipitation which excludes many warm season plant species from occurring in this LRU. Vegetation includes creosote bush, rabbitbrush, shadscale saltbush, spiny hopsage, winterfat, Nevada jointfir, and Joshua tree. At the upper elevations of the LRU, plant production and diversity are greater and blackbrush is a common dominant shrub. The Arid Western Mojave LRU generally lacks the diversity of yucca, cacti and warm season species found in the Arid Eastern Mojave.

Classification relationships

NDDB/Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California - Desert Saltbush Scrub.; J.O. Sawyer and T. Keeler-Wolf. 1995. Manual of California Vegetation - Spinescale Series.

Ecological site concept

This ecological site occurs on alluvial flat, flood plain playa, or lake plain landforms among the playa landscape of the Arid Eastern Mojave Land Resource Unit. The absence of mesquite suggests there is no water table within 30 feet (9 m) of the soil surface (Laity 2003). Alluvial and eolian processes bury the lake plain and in some areas of this highly dynamic system, the buried lake plain is within 5 feet of the soil surface. The soil particle size control section is loamy.

The central concept for this ecological site is in the Soil Survey of Antelope Valley Area, California (CA 675); map unit Px, Pond-Oban complex.

This is a group ecological site concept. Similar sites which fit under this group and share this general STM include: R030XA013CA, R030XA014CA, R030XA024CA, R030XA025CA, R030XA031CA, R030XA032CA, R030XG020CA, R030XY120CA

Associated sites

R030XA021CA	**Limy Sand 5-7** Limy Sand 5-7

Similar sites

R030XA015CA	**Coarse Loamy 5-7" P.Z.** Considered a community phase of R030XA009CA since they are found on very similar soil types and the same landforms. Playas are highly dynamic systems where drought, flooding, eolian material and altered hydrology can change vegetation composition relatively quickly.
R030XA024CA	**Outwash Plain** Considered a community phase of R030XA009CA since they are found on very similar soil types and the same landforms. Playas are highly dynamic systems where drought, flooding, eolian material and altered hydrology can change vegetation composition relatively quickly.
R030XA025CA	**Saline Bottom** Considered a community phase of R030XA009CA since they are found on very similar soil types and the same landforms. Playas are highly dynamic systems where drought, flooding, eolian material and altered hydrology can change vegetation composition relatively quickly.
R030XA014CA	**Clay Plain** Clay Plain - Shadscale and Mojave seablite are the dominant species. Inland saltgrass is the dominant perennial grass. Considered a community phase of R030XA009CA since they are found on very similar soil types and the same landforms. Playas are highly dynamic systems where drought, flooding, eolian material and altered hydrology can change vegetation composition relatively quickly.
R030XA031CA	**Sodic Dunes 5-7" P.Z.** Considered a buried community phase of R030XA009CA. Playas are highly dynamic systems where drought, flooding, eolian material and altered hydrology can change vegetation composition relatively quickly.

R030XA032CA	**Sodic Flat** Considered a community phase of R030XA009CA since they are found on very similar soil types and the same landforms. Playas are highly dynamic systems where drought, flooding, eolian material and altered hydrology can change vegetation composition relatively quickly.
R030XA013CA	**Clay Flat** Considered a community phase of R030XA009CA since they are found on very similar soil types and the same landforms. Playas are highly dynamic systems where drought, flooding, eolian material and altered hydrology can change vegetation composition relatively quickly.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex spinifera*
Herbaceous	(1) *Achnatherum hymenoides*

Physiographic features

This site occurs on alluvial flats, lake plain and flood plain playa landforms. Elevations are 2300 to 3200 feet. Slopes range from 0 to 5 percent.

Table 2. Representative physiographic features

Landforms	(1) Alluvial flat (2) Flood-plain playa (3) Lake plain
Ponding duration	Very brief (4 to 48 hours)
Ponding frequency	Rare
Elevation	701–975 m
Slope	0–5%
Aspect	Aspect is not a significant factor

Climatic features

The climate on this site is characterized by cool, relatively dry winters (30 to 60 degrees F) and hot, dry summers (70 to 100 degrees F). The average annual precipitation ranges from 3 to 7 inches with most falling as rain from November to March. Mean annual air temperature is 60 to 64 degrees F.

The average frost free period is 200 to 250 days.

Table 3. Representative climatic features

Frost-free period (average)	250 days
Freeze-free period (average)	223 days
Precipitation total (average)	178 mm

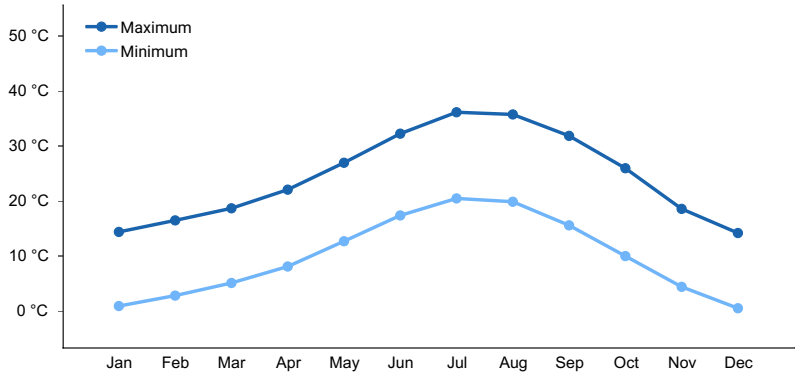


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

The plant community for this site is not influenced by water from a wetland or stream.

Soil features

The soils that characterize this site are found on the alluvial flats, lake plain and flood plain playa landforms of an intermountain basin. The soils are moderately well drained to somewhat excessively drained, very deep and formed in mixed alluvium from mostly granitic rock sources. Surface textures vary from fine sands to clay loams and silty clay loams. The particle size control section is fine-loamy to coarse-loamy. Natric and argillic subsurface horizons are common among these soils and associated soils. Available water capacity is high and the hazard of water erosion is slight. Wind erosion hazard is moderate. Effective rooting depth is 60 inches or more. Water tables are greater than 60 inches.

Table 4. Representative soil features

Family particle size	(1) Loamy
Drainage class	Moderately well drained to somewhat excessively drained
Permeability class	Very slow to moderately rapid
Soil depth	51–152 cm
Available water capacity (0-101.6cm)	9.91–18.54 cm
Calcium carbonate equivalent (0-101.6cm)	0–1%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	5–13
Soil reaction (1:1 water) (0-101.6cm)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0–10%

Table 5. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Soil depth	Not specified
Available water capacity (0-101.6cm)	5.08–18.54 cm

Calcium carbonate equivalent (0-101.6cm)	0–20%
Electrical conductivity (0-101.6cm)	0–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	1–100
Soil reaction (1:1 water) (0-101.6cm)	6.6–11
Subsurface fragment volume <=3" (Depth not specified)	0–25%

Ecological dynamics

This site is a very stable plant community so long as the site is undisturbed. Destructive impacts such as land clearing may reduce cover of the saltbushes, perennial grasses and the cryptogamic crust. With a loss of perennial cover and disturbance of the crust, non-native annual forbs and grasses such as red-stem filaree, red brome, cheatgrass and Schismus will readily invade this site. Wind erosion will most likely increase.

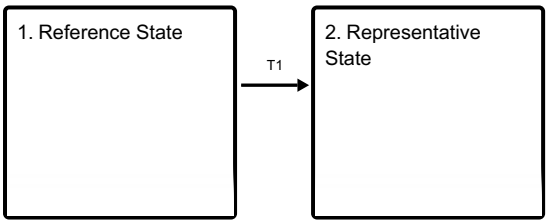
Portions of the ecological site are subjected to frequent sediment deposition and removal when adjacent to dune fields. When plants grow in these areas, eolian material is trapped beneath and around plants leading to accumulation which can bury plants and allow minor species to become more abundant, pioneer species are likely to increase and other species uncommon at this site may become established. Also, those portions of this ecological site situated in the flood plain playa are subjected to flooding disturbance which may also initiate secondary succession.

Among the species likely to increase the most following a disturbance event is fourwing saltbush. Fourwing saltbush is adaptable on sites with declining water tables, brackish groundwater, or saline soils (Doria and Aldon 1993). On the proposed nuclear waste site at Yucca Mountain, Nevada, fourwing saltbush occurs in both early-successional creosotebush disturbed by heavy equipment and undisturbed creosotebush associations. In blackbrush communities on Yucca Mountain, it occurs on disturbed sites but is nearly absent from undisturbed sites (Gabbert et. al 1995).

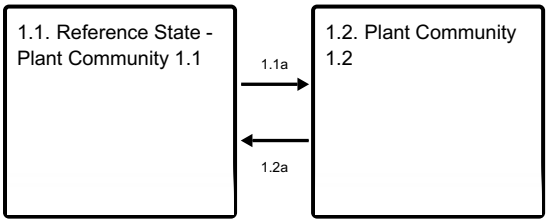
This community is usually unaffected by fire because of low fuel loads. The foliage of the chenopods appears to have fire-retarding qualities associated with the salt content of the leaves. A severe fire, however, will typically kill the aboveground portions. If burned, saltbushes can resprout from the root crown or underground portions of the stem. These species can also reestablish sites through an abundance of wind-dispersed seed from adjacent unburned sites.

State and transition model

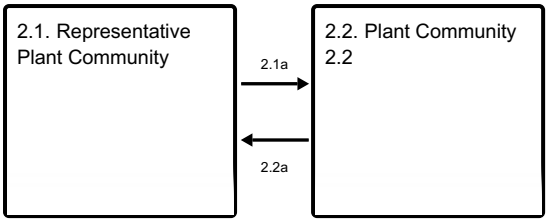
Ecosystem states



State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Reference State

The reference state is representative of the natural range of variability under pristine conditions. Plant communities are dynamic in response to changes in disturbance regimes and weather patterns. Plant community phase changes are primarily driven by long-term drought. Historically, fire had little impact in this system due to low fuel loading and widely spaced vegetation.

Community 1.1
Reference State - Plant Community 1.1

This site is the historic climax plant community. This community is characterized by low, grayish, microphyllous shrubs, 0.3 to 1 meter tall, with some succulent species. Stands are typically dominated by spinescale, with other saltbush species occurring. Potential vegetative composition is 10% grasses, 10% forbs and 80% shrubs. Perennial grasses include Indian ricegrass, desert needlegrass and bottlebrush squirreltail. Annual grasses and forbs are seasonally present. A well-developed cryptogamic crust is common. This site is stable in this condition. This plant community occurs across the west end of the MLRA. Introduced annuals such as red brome, cheatgrass, schismus, and filaree have invaded the historic climax plant community and have become a dominant component of the herbaceous cover. This change from native to non-natives may be due to a combination of factors such as (1) invasion of alien species, (2) changes in the kinds of animals and grazing pressure, and (3) drought. This site is stable in this condition. Annual forbs and grasses provide valuable forage in favorable years. The following table lists the major plant species and percentages by weight, air dry, of the total plant community that each contributes in an average production year. Fluctuations in species composition and relative production may change from year to year dependent upon abnormal precipitation or other climatic factors.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	179	359	538
Grass/Grasslike	22	45	67
Forb	22	45	67
Total	**223**	**449**	**672**

Table 7. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	12-20%
Grass/grasslike foliar cover	1-2%
Forb foliar cover	1-2%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%

Water	0%
Bare ground	0%

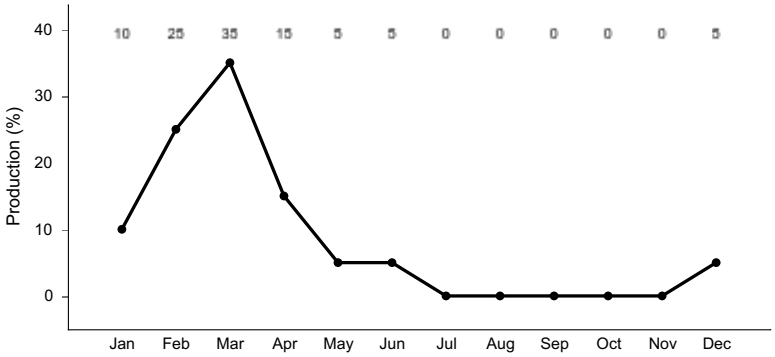


Figure 3. Plant community growth curve (percent production by month). CA3001, Spinescale. Growth starts in late winter. Flowering and seed set occur by June. Seeds remain on the shrubs for several months. Dormancy occurs during the hot summer months..

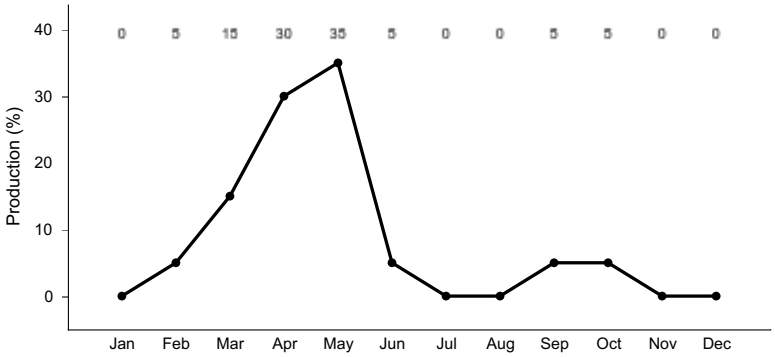


Figure 4. Plant community growth curve (percent production by month). CA3022, Indian ricegrass. Growth begins in late winter, flowering and fruiting finished by the hot summer months. Early fall rains can trigger a flush of new growth..

Community 1.2
Plant Community 1.2

This plant community is characteristic of an early seral, post- disturbance plant community. Initially, this plant community phase is heavily dominated by herbaceous vegetation. Perennial grasses provide favorable sites for the establishment of shrub seedlings. This plant community is considered at risk of invasion by non-native annuals. Non-natives take advantage of increased availability of critical resources following a fire or other disturbance.

Pathway 1.1a
Community 1.1 to 1.2

Wildfire, prolonged drought, disease, insect attack, or any other type of brush removal.

Pathway 1.2a
Community 1.2 to 1.1

Absence from disturbance and natural regeneration over time.

State 2
Representative State

The Representative State is characterized by the presence of non-native annuals in the understory. Plant communities in this state function very similarly to the reference state, however, ecological resilience may be reduced by the presence of the non-natives. Introduced annuals such as red brome, Mediterranean grass and

redstem filaree have invaded the reference plant community and have become a component of the herbaceous cover. These non-native annuals are highly flammable and promote wildfires where fires historically have been infrequent. Mature shadscale persists after this invasion by non-native annuals, however shrubs seedling and desirable grasses suffer reduced vigor and limited reproductive capability due to increased competition from non-natives.

Community 2.1
Representative Plant Community

Plant community composition is similar to the reference plant community with the trace of non-natives in the understory. Ecological processes have not been compromised at this time, but ecological resilience is reduced by the presence of non-natives. This plant community will respond differently following a disturbance, when compared to the reference plant community. Non-natives likely to invade this site include red brome and Mediterranean grass. Increased fine fuels provided by non-native annuals can drastically change the natural fire return interval.

Community 2.2
Plant Community 2.2

This plant community is characteristic of an early seral, post-disturbance plant community and may or may not be dominated by non-native annuals. Perennial native bunchgrasses recover quickly and provide favorable sites for the establishment of shrub seedlings. Disturbance may result in increased bare ground, increasing the risk of soil erosion. This plant community is considered at-risk, due to the increased fuel loading from herbaceous biomass. Management should be focused on minimizing the threat of wildfire and reducing anthropogenic impacts to protect soil and ecological resources.

Pathway 2.1a
Community 2.1 to 2.2

Surface disturbance or fire removes mature shrubs and favors an increase of herbaceous vegetation, native and non-native.

Pathway 2.2a
Community 2.2 to 2.1

Recovery of woody perennials and absence from disturbance.

Transition T1
State 1 to 2

Introduction of non-native species due to a combination of factors including: surface disturbance, changes in the kinds of animals and their grazing patterns, drought and/or changes in fire history. Non-natives can alter disturbance regimes significantly from their natural or historic range and change ecological processes therefore creating an unlikely scenario to restore the site back to reference.

Additional community tables

Animal community

This site provides habitat for small mammals such as kangaroo rats and ground squirrels. Fur and game mammals include coyotes and black-tailed jackrabbits. Ravens, raptors and various songbirds are also common. The soils of this site are limited for burrowing reptiles such as the desert tortoise due to the clayey subsoil horizons. Occasional ponding may also limit burrowing habitat.

This site has limited value for livestock grazing. In favorable years, abundant annual forbs and grasses may provide limited grazing by sheep.

General guide to initial stocking rate. Before making specific recommendations, an on-site evaluation must be made. Stocking rate is based on proper use factors and proportion of grazeable forage.

Pounds/acre AC/AUM
air dry
Normal Years 400 5-20

Hydrological functions

Runoff is negligible, low or medium. Hydrologic soil group C - soils having slow infiltration rates when throughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. Hydrologic conditions: good - >70% ground cover (includes litter, grass and brush overstory); fair - 30 to 70% ground cover; poor - <30% ground cover.

Soil Series: Norob
Hydrologic Group: C
Hydrologic Conditions and Runoff Curves:
good 79; fair 81; poor 85

Recreational uses

This site is valued for open space and is used by joggers, mountain bikers and other off-road enthusiasts. Off-road vehicles can easily damage the cryptogamic crust and vegetative cover, and should be restricted to existing roads and trails.

Other information

Military Operations - Vehicles should be limited to existing roads and trails. To reduce wind erosion, limit disturbance to the cryptogamic crust and clearing of vegetation. Native species indigenous to this site are recommended for any revegetation efforts.

Inventory data references

Sampling technique

_5_ NV-ECS-1
_1_ SCS-Range 417
___ Other

Type locality

Location 1: San Bernardino County, CA	
Township/Range/Section	T10N R6W S7
General legal description	South of Kramer Junction, Edwards Air Force Base, San Bernardino Co., California

Other references

Doria, J. R. C., & Aldon, E. F. 1993. Fourwing saltbush seedling survival using saline irrigation. Arid Land Research and Management, 7(3), 243-251.

Gabbert, W. D., Schultz, B. W., Angerer, J. P., & Ostler, W. K. 1996. Plant succession on disturbed sites in four plant associations in the northern Mojave Desert. In Proceedings: Wildland Shrub and Arid Land Restoration Symposium (pp. 183-188).

Hereford, R., R.H. Webb and C. I. Longpre. 2004. Precipitation history of the Mojave Desert region, 1893-2001 (No. 117-03).

Hickman, J.C. (ed) 1995. The Jepson Manual - Higher Plants of California.

Kottek, M., Grieser, J., Beck, C., Rudolf, B., & Rubel, F. (2006). World map of the Köppen-Geiger climate classification updated. Meteorologische Zeitschrift, 15(3), 259-263.

Laity, J. 2003. Aeolian destabilization along the Mojave River, Mojave Desert, California: linkages among fluvial, groundwater, and aeolian systems. Physical Geography, 24(3), 196-221.

Peterson, F.F. 1981. Landforms of the Basin and Range Province defined for soil survey.

Contributors

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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	11/21/2024
Approved by	Kendra Moseley
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:**