USDA Natural Resources
Conservation Service

Ecological site R030XB243CA
Andesite Hills

Last updated: 2/25/2025
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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.

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 ecological site is found in an upland positon on shoulders, sideslopes and summits of hills and mountains of andesite geologic parent material. It is found on all aspects.

The soil of this ecological site is very shallow to shallow. The soil's patent material is andesite alluvium and colluvium.

Similar sites

R030XB201AZ	**Andesite Hills 6-9" p.z. Coarse**
R030XB220AZ	**Andesite Hills 6-9" p.z.** This is the same ecological site which was copied to this description in order to avoid identification duplication in the event the

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Ambrosia dumosa* (2) *Eriogonum fasciculatum*
Herbaceous	(1) *Achnatherum speciosum*

Physiographic features

This ecological site is found in an upland positon on shoulders, sideslopes and summits of hills and mountains of andesite geologic parent material. It is found on all aspects.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Mountain
Flooding frequency	None
Ponding frequency	None
Elevation	2,500–3,500 ft
Slope	20–70%
Aspect	Aspect is not a significant factor

Climatic features

The climate is arid and warm. Annual precipitation ranges from 6 to 9 inches. About 65 percent of the rainfall comes from October through May as gentle rain from Pacific storms which may last for a couple of days. The rest of the rainfall comes during the summer monsoon season from July through September as spotty, brief, intense thunderstorms. Snow rarely falls, and only remains on the ground a few hours at most. Annual air temperature ranges from 59 to 70 degrees F. The average frost-free period ranges from 156 to 259 days.

Table 3. Representative climatic features

Frost-free period (average)	259 days

Freeze-free period (average)	290 days
Precipitation total (average)	9 in

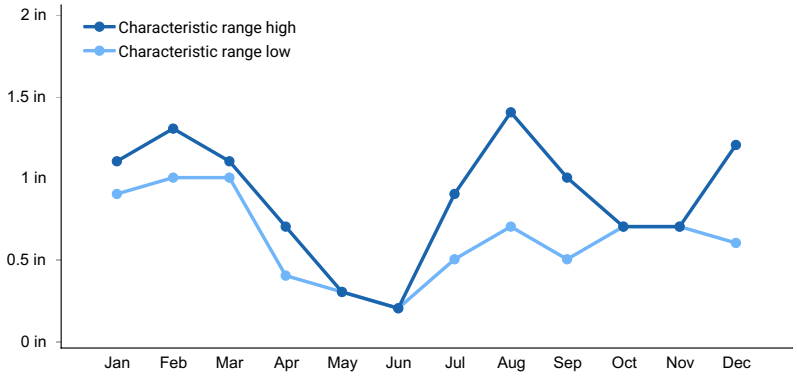


Figure 1. Monthly precipitation range

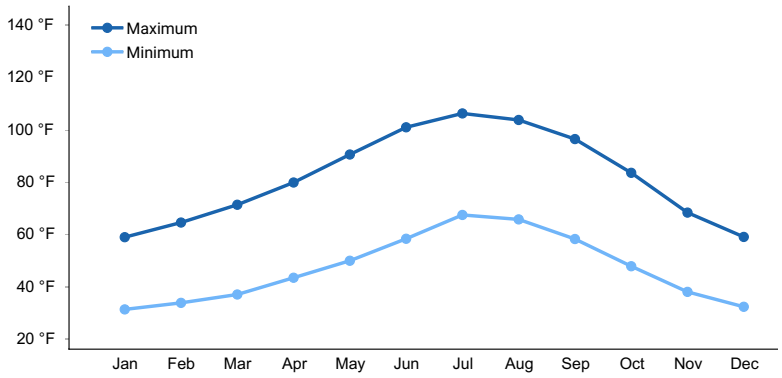


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

Soil features

The soil of this ecological site is very shallow to shallow. The soil's patent material is andesite alluvium and colluvium. The soil surface texture is extremely gravelly sandy loam and the subsoil textures is very gravelly sandy loam. The soil's available water capacity is very low. The soil wind erosion hazard is slight and water erosion hazard is severe. The soil pH range is 7.9-8.4. The soil moisture regime is typic aridic and soil temperature regime is thermic. Andesite bedrock is encountered at a depth of 4-5 inches. Rock outcrop is associated and intermixed with this ecological site.

A typical soil profile is:
A-0 to 2 inches; extremely gravelly loam
C-2 to 5 inches; very gravelly loam
2R-5 inches; unweathered bedrock

The soil taxinomic classification is Loamy-skeletal, mixed, superactive, calcareous, thermic Lithic Torriorthents.

Soils correlated to this ecological site include map unit 627118, Razorback soil, Mohave County, AZ, Southern Part SSA.

Table 4. Representative soil features

Parent material	(1) Alluvium–andesite
Surface texture	(1) Extremely gravelly sandy loam
Family particle size	(1) Loamy

Drainage class	Somewhat excessively drained
Permeability class	Moderately rapid
Soil depth	4–7 in
Surface fragment cover <=3"	65–80%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	0.1–0.4 in
Calcium carbonate equivalent (0-40in)	5–10%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	65–80%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The historic climax plant community (HCPC) for a site in North America is the plant community that existed at the time of European immigration and settlement. It is the plant community that was best adapted to the unique combination of environmental factors associated with the site at that time. The HCPC was in dynamic equilibrium with its environment and was able to avoid displacement by the suite of disturbances and disturbance patterns (magnitude and frequency) that naturally occurred within the area occupied by the site. Natural disturbances, such as drought, fire, grazing of native fauna, and insects, were inherent in the development and maintenance of the plant community. The effects of these disturbances are part of the range of characteristics of the site that contribute to the dynamic equilibrium. Fluctuations in the plant community's structure and function caused by the effects of these natural disturbances establish the boundaries of dynamic equilibrium. They are accounted for as part of the range of characteristics for the ecological site. The HCPC is not a precise assemblage of species for which the proportions are the same from place to place or from year to year. Variability is apparent in productivity and occurrence of individual species.

The HCPC for this ecological site has been estimated by sampling relict or relatively undisturbed sites and/or reviewing historic records.

A plant community that is subjected to abnormal disturbances and physical site deterioration or that is protected from natural influences, such as fire and grazing, for long periods seldom typifies the HCPC. Any physical site deterioration caused by the abnormal disturbance may result in the crossing of a threshold or irreversible boundary to another state, or equilibrium, for the ecological site. There may be multiple thresholds and states possible for an ecological site, determined by the type and or severity of abnormal disturbance. The known states and transition pathways for this ecological site are described in the accompanying state and transition model.

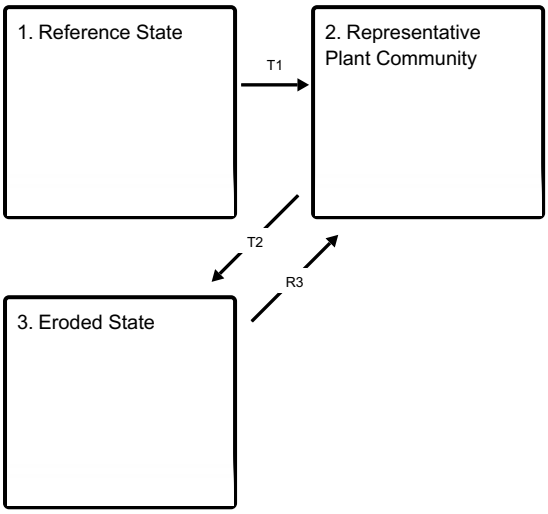
The "Plant Community Plant Species Composition" table provides a list of species and each species or group of species' annual production in pounds per acre (air-dry weight) expected in a normal rainfall year. Low and high production yields represent the modal range of variability for that species or group of species across the extent of the ecological site.

The "Annual Production by Plant Type" table provides the median air-dry production and the fluctuations to be expected during favorable, normal, and unfavorable years. The present plant community on an ecological site can be compared to the various common vegetation states that can exist on the site. The degree of similarity is expressed through a similarity index. To determine the similarity index, compare the production of each species to

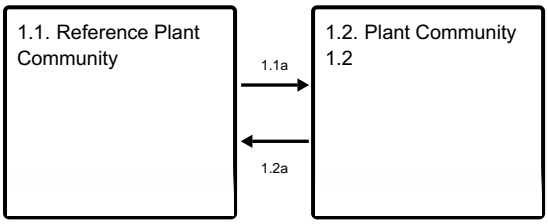
that shown in the plant community description. For each species, count no more than the maximum amount shown for the species, and for each group, count no more than the maximum shown for the group. Divide the resulting total by the total representative value shown in the “Annual Production by Plant Type” table for the reference plant community. Variations in production due to above or below normal rainfall, incomplete growing season or utilization must be corrected before comparing it to the site description. The “Worksheet for Determining Similarity Index” is useful in making these corrections. The accompanying growth curve can be used as a guide for estimating percent of growth completed.

State and transition model

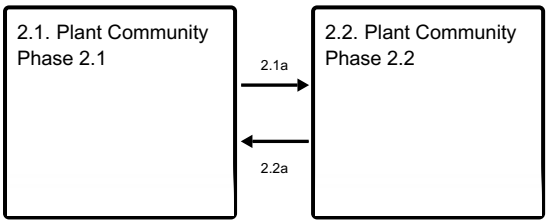
Ecosystem states



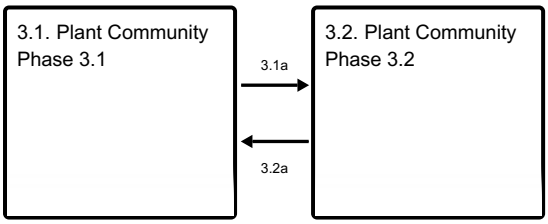
State 1 submodel, plant communities



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. Fire is rare in this system. This ecological site experiences seasonal flooding and is important for redistributing moisture and nutrients throughout the landscape. Timing of disturbances combined with weather events determines plant community dynamics.

Community 1.1
Reference Plant Community

The dominant aspect of this plant community is a desert shrub. It consists of a mix of four shrubs: creosotebush, white bursage, Nevada Mormon tea and flattop buckwheat. Desert needlegrass is usually present on this site and is sometimes abundant. The stocking rate will have to be determined each year based on growth from winter and spring moisture and steep slopes. The climax plant community is best used to support desert bighorn sheep which are well suited to the site.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	87	200	313
Grass/Grasslike	12	40	70
Forb	1	10	17
Total	**100**	**250**	**400**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0-2%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%
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%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	0-2%
>0.5 <= 1	–	–	0-2%	–
>1 <= 2	–	8-12%	–	–
>2 <= 4.5	–	–	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

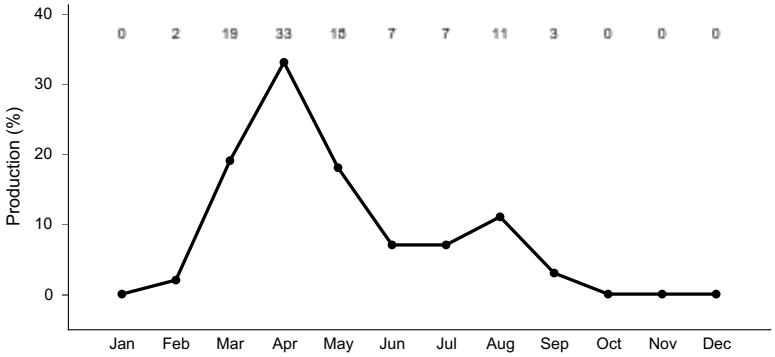


Figure 4. Plant community growth curve (percent production by month). AZ3022, 30.2 6-9" p.z. upland sites. Growth begins in the late winter, most growth occurs in the spring..

Community 1.2
Plant Community 1.2

This plant community is characteristic of a post-disturbance plant community phase. Initially, it is heavily dominated by herbaceous vegetation and short-lived perennials. Sprouting shrubs quickly recover and provide a favorable environment for establishment of shrub seedlings. This plant community is ‘at-risk’ of invasion by non-natives. Non-native species are able to take advantage of increased availability of critical resources following disturbances.

Pathway 1.1a
Community 1.1 to 1.2

Drought, wildfire, disease or insect attack or other event which reduces vegetation cover

Pathway 1.2a
Community 1.2 to 1.1

Absence from disturbance and natural regeneration over time.

State 2
Representative Plant Community

The Representative Plant Community is characterized by the presence of non-native species in the understory. A biotic threshold is crossed with the introduction of non-natives that are difficult to remove from the system and have they potential to significantly alter disturbance regimes from their historic range of variation. Non-native annuals will persist once introduced into the plant community, due to their annual growth form, abundant seed production and long term seed viability. Non-native annuals such as red brome and cheatgrass are potential invaders on this ecological site. These non-native annuals are highly flammable and promote wildfires where fires historically have been infrequent.

Community 2.1
Plant Community Phase 2.1

Species composition is similar to the reference plant community. Ecological processes have not been compromised at this time, however, ecological resilience is reduced by the presence of non-natives. This plant community phase will respond differently following disturbance, when compared to the reference plant community. Management focused on decreasing the amount of anthropogenic disturbance is important for maintaining the health of perennial native species that protect the site against erosion.

Community 2.2
Plant Community Phase 2.2

This plant community is characteristic of a post-disturbance plant community. It is dominated by herbaceous vegetation, which may or may not be non-native, woody perennials are increasing. Nevada ephedra, desert almond

and desert willow commonly sprout from rhizomes following disturbance. Sprouting species provide favorable sites for germination of species such as brittlebush, ratany, and bursage which reproduce sexually and are prolific seed producers. This plant community is ‘at-risk’ of increased erosion due to reduction of deep rooted perennials and increased non-native annuals.

Pathway 2.1a
Community 2.1 to 2.2

Drought, wildfire, disease or insect attack or other event which reduces vegetation cover

Pathway 2.2a
Community 2.2 to 2.1

Absence of disturbance and natural regeneration over time.

State 3
Eroded State

This state is characterized by reduced cover of woody perennials. Bare ground is increasing, leading to increased erosion, decreased infiltration and loosening of the soil surface causing channeling. An abiotic threshold has been crossed preventing the natural repair of this plant community. Feedbacks keeping this state stable include reduced perennial vegetative cover causing increased runoff and decreased infiltration preventing the establishment of desirable perennial vegetation.

Community 3.1
Plant Community Phase 3.1

This plant community is characteristic of a short disturbance return interval. Long-lived woody perennials are decreasing. The ability of this site to dissipate energy during large flow events is severely reduced contributing to ecological damage downstream.

Community 3.2
Plant Community Phase 3.2

This plant community is characterized by the loss of long-lived woody perennials. Ecological processes have been altered including connectivity within the watershed, ground water recharge and habitat quality. Soil and soil nutrients are being redistributed down stream, leading to down cutting and channel widening.

Pathway 3.1a
Community 3.1 to 3.2

Seasonal flooding, drought, wildfire, disease, insect attack or other mechanism which reduces vegetation cover.

Pathway 3.2a
Community 3.2 to 3.1

Absence from disturbance and natural regeneration over time, allow some perennials to return to the system increasing stability.

Transition T1
State 1 to 2

Introduction of non-native species due to a combination of factors including: 1) surface disturbance, 2) changes in the kinds of animals and their grazing patterns, 3) drought and/or 4) changes in fire history.

Transition T2

State 2 to 3

Large scale reoccurring disturbance, natural or anthropogenic.

Restoration pathway R3
State 3 to 2

Ecological processes can be restored to the site, but non-natives remain. Possible restoration techniques include stabilizing the site by reestablishing native perennials and the use of artificial rip-rap to dissipate energy and reestablish the flood plain.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
1	**Shrubs**			131–232	
	burrobush	AMDU2	*Ambrosia dumosa*	50–75	–
	creosote bush	LATR2	*Larrea tridentata*	25–38	–
	Eastern Mojave buckwheat	ERFA2	*Eriogonum fasciculatum*	25–38	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	25–38	–
	Shrub, other	2S	*Shrub, other*	2–12	–
	littleleaf ratany	KRER	*Krameria erecta*	0–8	–
	catclaw acacia	SEGR4	*Senegalia greggii*	0–8	–
	Mojave sage	SAMO3	*Salvia mohavensis*	0–8	–
	pricklypear	OPUNT	*Opuntia*	2–8	–
	water jacket	LYAN	*Lycium andersonii*	2–5	–
	Mojave woodyaster	XYTOT	*Xylorhiza tortifolia var. tortifolia*	0–2	–
Grass/Grasslike					
2	**Grasses**			25–38	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	25–28	–
	slim tridens	TRMU	*Tridens muticus*	0–5	–
	threeawn	ARIST	*Aristida*	0–5	–
Forb					
3	**Forbs**			2–12	
	Forb, annual	2FA	*Forb, annual*	2–10	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	0–2	–

Animal community

The climax plant community is best used to support desert bighorn sheep which are well suited to the site.

This site would be very hard to degrade by livestock due to steep slopes and loose rock. Degradation could be caused by desert bighorn sheep or burrow. Overuse by these species could result in losing the diversity of shrubs.

Wildlife species found on this ecological site include desert bighorn sheep, burrow, ants, lizards, snakes and ground squirrels.

Other references

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

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.

Salem, B. B. (1989). Arid zone forestry: a guide for field technicians (No. 20). Food and Agriculture Organization (FAO).

Contributors

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Approval

Sarah Quistberg, 2/25/2025

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)	
Contact for lead author	
Date	05/10/2025
Approved by	Sarah Quistberg
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:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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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):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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

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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):**

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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:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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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:

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17. **Perennial plant reproductive capability:**
